DOCUMENT RESUME

ED 156 511 SE 024 489

TITLE	Case Studies in Science Education, Booklet XIII: Findings II.
INSTITUTION	Illinois Univ., Urbana. Center for Instructional Research and Curriculum Evaluation.
SPONS AGENCY	National Science Foundation, Washington, D.C.
PUB DATE	Jan 78
CONTRACT	NSF-C-7621134
NOTE	144p.; For related documents, see SE 024 476-491
EDRS PRICE	MF-$0.83 HC-$7.35 Plus Postage.
DESCRIPTORS	*Case Studies (Education); Curriculum; *Educational Research; Educational Trends; Elementary Secondary Education; Field Studies; *Instruction; Learning; *Mathematics Education; *Science Education; *Social Sciences; Teachers
IDENTIFIERS	*National Science Foundation

ABSTRACT

This booklet is the fourteenth of a series of 16 booklets that together describe and present findings for a study which involved field observations and a survey of science teaching and learning in American public schools during the school year 1976-77. The study was undertaken to provide the National Science Foundation with a portrayal of current conditions in K-12 science classrooms to help make the Foundation's programs of support for science education consistent with national needs. Eleven high schools and their feeder schools were selected to provide a diverse and balanced group of case study sites. One field researcher was assigned to each site and instructed to find out what was happening and what was felt important in science (including mathematics and social science) programs. Findings from the case studies which pertain to student learning, the teacher in the classroom, and the school and the community are presented in this booklet. (MN)

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TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) AND USERS OF THE ERIC SYSTEM."

Booklet XIII
Findings II

SE 024 489

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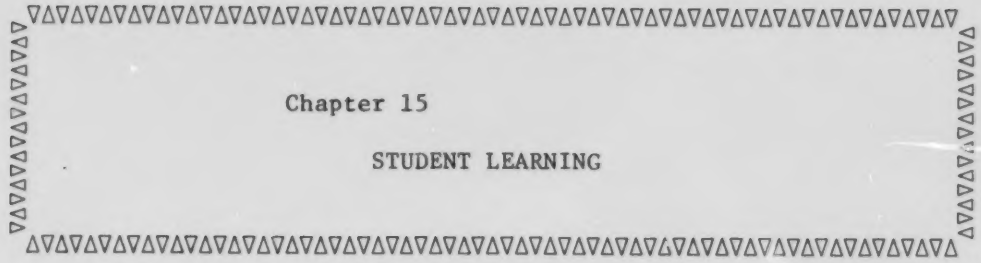
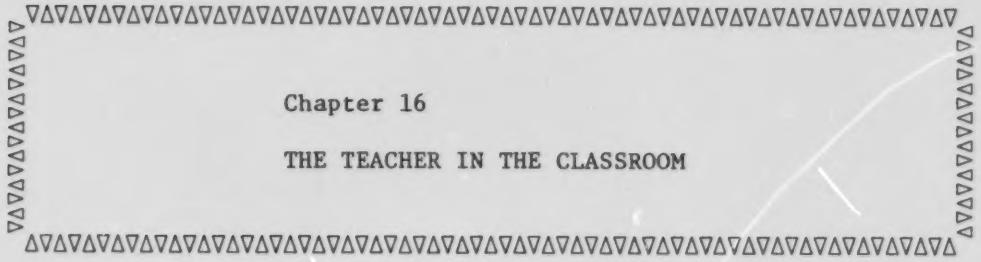
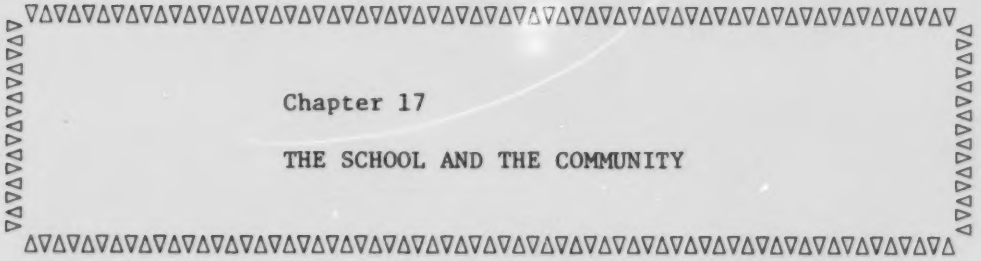
Case Studies in Science Education
A project for the National Science Foundation
conducted by CIRCE and CCC
270 Education Building
University of Illinois at Urbana-Champaign

CASE STUDIES IN SCIENCE EDUCATION

BOOKLET XIII







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University of Illinois at Urbana-Champaign

January 1978

"The material in this report is based upon work supported by the National Science Foundation under Contract No. C 7621134. Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

The Project

Case Studies in Science Education is a collection of field observations of science teaching and learning in American public schools during the school year 1976-77. The study was undertaken to provide the National Science Foundation with a portrayal of current conditions in K-12 science classrooms to help make the foundation's programs of support for science education consistent with national needs. It was organized by a team of educational researchers at the University of Illinois.

Eleven high schools and their feeder schools were selected to provide a diverse and balanced group of sites: rural and urban; east, west, north and south; racially diverse; economically well-off and impoverished; constructing schools and closing schools; innovative and traditional. They were finally selected so that a researcher with ample relevant field experience could be placed at each. To confirm findings of the ethnographic case studies and to add special information, a national stratified-random-sample of about 4000 teachers, principals, curriculum supervisors, superintendents, parents, and senior class students were surveyed. Survey questions were based on observations at the eleven case-study sites.

The field researchers were instructed to find out what was happening, what was felt important, in science (including mathematics and social science) programs. On site from 4 to 15 weeks they were not required to coordinate their work with observers at other sites. Questions originally indicated important by the NSF or identified early in the field were "networked" by the Illinois team. Efforts to triangulate findings were assisted by reports of site visit teams.

Each observer prepared a case study report which was preserved intact as part of the final collection, and later augmented with cross-site conclusions by the Illinois team. The cost of the study was just under $300,000, taking 18 months actual time and about 6 research-person years to complete.

In the principal findings it was noted that each place was different in important ways, that each teacher made unique contributions. Nationally we found that science education was being given low priority, yielding to increasing emphasis on basic skills (reading and computation). Still, the CSSE-high-school science faculties worked hard to protect courses for the college-bound, with many of these courses kept small by prerequisites and "tough" grading. Only occasional efforts were made to do more than "read about" science topics in most of the elementary schools. Although ninth-grade biology and eighth-grade general science flourished, general education aims for science instruction were not felt vital at any level. Seldom was science taught as scientific inquiry--all three subjects were presented as what experts had found to be true. School people and parents were supportive of what was chosen to be taught, complaining occasionally that it was not taught well enough. The textbook usually was seen as the authority on knowledge and the guide to learning. The teacher was seen to be the authority on both social and academic decorum. He or she worked hard to prepare youngsters for tests, subsequent instruction, and the value-orientations of adult life. Though relatively free to depart from district syllabus or community expectation, the teacher seldom exercised either freedom.

Each of the above statements is only partly correct. This summary is a drastic oversimplification of the circumstances observed by the field people and portrayed in the case study reports. The picture at each of the sites--seen through the experienced but singular eyes of our observer--is a special picture, greatly influenced by the administrators, the parents, and the students encountered; colored with technical, professional, economic and social problems. Somehow the pictures do not aggregate across sites to be either the picture of national education represented by the popular press (though no less aggrieved) or that presented in the professional education publication (though no less complicated). It is an interesting collection.

Robert E. Stake
Jack A. Easley, Jr.
Codirectors

LIST OF CASE STUDY SITES

	Code Name	Description	Field Observer
1	RIVER ACRES	a suburb of Houston	Terry Denny
2	FALL RIVER	a small city in Colorado	Mary Lee Smith
3	ALTE	a suburb of a large Midwestern city	Louis M. Smith
4	BRT	a consolidated district in rural Illinois	Alan Peshkin
5	URBANVILLE	a metropolitan community of the Pacific Northwest	Wayne W. Welch
6	PINE CITY	a rural community in Alabama	Rob Walker
7	WESTERN CITY	a small city in middle California	Rodolfo G. Serrano
8	COLUMBUS	the Columbus, Ohio, school district	James R. Sanders & Daniel L. Stufflebeam
9	ARCHIPOLIS	an Eastern middle seaboard city	Jacquetta Hill-Burnett
10	VORTEX	a small city in Pennsylvania	Gordon Hoke
11	GREATER BOSTON	an urban section in metropolitan Boston	Rob Walker

CASE STUDIES IN SCIENCE EDUCATION--ROSTER

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Chapter 15

STUDENT LEARNING

As we talked to people in the schools we found them ready to discuss three aspects of student involvement in schooling:

experience

performance

motivation

Topics such as aptitudes, misbehavior, personality, and emotions, though related of course, seemed less likely to sustain a conversation. The teachers saw motivation as a matter of great importance, one that appeared to be a major obstacle for individual and group learning in many classrooms. We devote a section of this report to the topic beginning on p 15.

Student performance seemed to be a topic of increasing interest, although we know that teachers have been talking for many years about how well youngsters do in recitation, on tests, and in getting ready for subsequent courses. In matters of student experience the talk continued--as we believe it has for many years--to be centered on the courses a student is presently enrolled in, and what books, what topics, and what teachers he or she has had a chance to be exposed to.

It seemed natural to us to expect a conversation to shift easily from "experience" to "performance"--but we seldom found that it did. Somehow, when we were talking about experience, there seemed to be little talk about what the specific results of that learning opportunity were. And when they were talking about student performance there seemed to be relatively little attention to what sort of a situation it was that brought about that pattern of responses. We know that many researchers and others--whether disciples of Professor Skinner or not--are quick to link together the stimulus conditions with the response behavior. We seldom found a rhetorical linkage between experience and performance in the schools we visited.

Some of our colleagues say that this points to the very trouble with instruction in the schools, that the teachers do not think in terms of causes and effects. We heard plenty of casual talk about causes and effects, but little explicit or rigorous. But rather than conclude that the teachers were falling short in matters of diagnosis and explanation we were inclined to conclude that the simple cause and effect statements that are the basis of research studies are seldom adequately descriptive of the conditions of learning and teaching in the classroom. It seemed to us that teachers were successful in efforts to develop an elaborate discussion of the conditions in which teaching was occurring,

and to discuss some of the elaborate patterns of response--but neither they nor we had an adequate language and possibly not an adequate conceptual system for understanding why the children were learning or not learning*. (Even the descriptions of what they were learning were satisfying neither to us nor to the teachers.)

This was not apparently a sign of lack of concern on the part of teachers for their students--in fact they were impressive by their very concern. This somewhat compartmentalized thinking was not a condition that was true only of "weak" teachers, not true of the "strong." It was our conclusion that it was a general condition, that perhaps the teachers did not have a sufficiently complex and trustworthy conceptual system to encompass both the dynamics of the curricular arrangements and the dynamics of student comprehension. A good bit of our conclusion is speculation--what we were certain of is that the discussion of student experience and the discussion of student performance usually occurred separately.

It was not the purpose of this study to examine student experience or student performance.** We spent relatively small amounts of time observing and interviewing students. We found such cases as Rob Walker's description of Tom, a graduate (p 6:39) and Alan Peshkin's of Beth, a sophomore (p 4:19) helpful and insightful--but our attention usually was on the larger arrangements made for the teaching of science, math, and social studies. Therefore, there is little to report directly on student learning. What we will describe in the remainder of this chapter is more on the distinction we found between performance and experience, a lot on the role of testing as a provider of evidence of student performance, a just-promised section on student motivation, and a bit on how we saw racial and sex differences among students in the sites we visited.

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*Lee J. Cronbach. Beyond the Two Disciplines of Scientific Psychology, American Psychologist 30 (1975):116-127. Also in Gene V Glass, ed., Evaluation Studies: Review Annual, vol. 1, (Beverly Hills, California: Sage Publications, 1976.)

**The case in this study was defined as a high school and its feeder schools.

PERFORMANCE VERSUS EXPERIENCE*

We found it generally assumed that a good experience in the classroom leads to good performance. Simultaneously a student gains a skill at performing particular operations and an understanding of the implication of those operations, it is believed. Obviously it is possible to underemphasize either direct knowledge or tacit knowledge, either the manipulation or the broader meaning, but the grand belief is that if you teach well you will accomplish both.

What we also found in these eleven sites was a conviction that too little emphasis recently had been placed on the basic skills, particularly the mechanics of reading and computation, and that if the curriculum were properly invoked, if the obstacles to teaching were adroitly skirted, the result would be a satisfactory attainment of both performance and experience. There was little skepticism that a greater emphasis on the basic skills would result in even less attention to the kind of experience, topics, and conceptual associations that have been honored by classicists and reformers alike.

School practitioners and education professors, we observe, are inclined to disagree about the importance of many conceptual distinctions. This was one of them. Jerome Bruner and David Olson, for example, declared the view naive that one can substitute "instruction" for "learning through experience."** Are such professors splitting hairs, stressing the competition and even incompatibility between performance and experience?

---

*This is not the same argument as the one teachers have about whether to emphasize content or skill. In that case, as explained by one of our Texas interviewees, one teacher might put it at one extreme, saying:

> *I'm teaching totally from a content perspective, [with] X amount of content I want the students to know at the end of the year,*

while a teacher at the opposite extreme says:

> *It is my goal to teach the students skills, and content is irrelevant. Those skills might be that the student would know how to vote (or) how to decide on an issue such as abortion.*

In both those cases the teacher is pursuing an outcome, some preparation to be acquired by the student, whether a skill, some knowledge, or perhaps attitudes. Any of these satisfy the argument favoring performance. None are explicitly aimed at giving the student "experience" itself, such as the experience of voting, the experience of making key decisions, or any experience deemed important in itself.

**Jerome S. Bruner and David R. Olson. "Learning Through Experience and Learning Through Media," in Communications Technology and Social Policy, ed. George Gerbner, Larry P. Gross, and William H. Melody (New York: John Wiley and Sons, 1975).

Are the teachers insensitive to the dangers of imbalance tipped one way or the other, resolving the issue not so much in terms of what youngsters can best use but as to what the public wants taught? Perhaps some of both. We found most teachers thinking that too much emphasis had recently been placed on discovery-learning, hands-on demonstrations, field study, and contemporary topics, and though some of those aims were quite defensible, time spent on them did not serve the learner sufficiently well as he/she moved another grade further in school.

The split among teachers was apparent too. It was quite apparent in ALTE where teachers at the alternative school held aims for their students quite different from those of the teachers at the regular school. (The full discussion of the alternative school at ALTE indicates a more complex story than this brief vignette; see p 3:104.)

> The mixed feelings of the ALTE faculty are attested to from a variety of sources. The high school curriculum guide, for instance, does not contain any reference to the "A" school; recruiting for the school does occur visibly (e.g., signs posted in the corridors) and is supported by the administration. Comments by teachers in committee meetings ("they <u>are</u> a part of ALTE High") carry a flavor of implicit separateness and/or exclusion. In return, the A school faculty sees itself as apart from, and sometimes hostile toward, the regular faculty. The Alternative School students are explicitly negative toward ALTE High School. The stuck-up youngsters, the boring curriculum, the domineering faculty, the punitive administration, and the general lack of freedom for doing one's own thing are recurring reactions in the school.
>
> . . .
>
> Secondly, much of the discussion and exchange of epithets with and about the A school seems beside the point, e.g., cop out, dropout, spaced out, and so forth vs. boring, regimented, authoritarian. The underlying fundamental issue, in this observer/analyst's speculative view, is that the A school represents a fundamental critique of the core values, (e.g., excellence as specialized knowledge) and the central procedures (e.g., high-demand, teacher-structured courses and classes) at ALTE High School, as well as of the relationship between that kind of school and the larger society of which the community of ALTE is representative.

Here the critique came from teachers, the alternative school teachers, and from students and parents associated with that school, and it was a critique of the orientation to performance learning by teachers who would be considered some of the most able science, math, and history teachers in the country.

In the 1960s when the "hands-on, messing about" curriculum projects were being developed and promoted, the sway seemed to be with those who advocated experience for the students. Now the pendulum swings back. In the URBANVILLE case study (p 5:16) Wayne Welch reported:

> Teachers who tried some of the newer curriculums have changed back.

And Rudy Serrano reported from WESTERN CITY (p 7:9):

> For various reasons the elementary schools appear to be giving up the service programs that numbers of them had established a few years earlier.

Further evidence of reorientation toward performance skills and away from conceptualized experience is found in the FALL RIVER case study (p 2:39) and in the ALTE case study (p 3:46.) A teacher in BRT summarized the present condition this way:

> *Now it seems, the shift is "back to the basics", like learning vocabulary and laws and problem solving more than technique. Lab technique is still important but there's all this worry about kids not doing well on the ACT and SAT. I look at the new texts that are coming out. They tend to be more organized, giving the student information and then expecting them to remember it. I'd say we've always been more traditional here than larger schools in the metropolitan area so I don't think parents were that much aware of a change back, but I get it from parents who are also faculty. You know, "my son or daughter didn't do well when they took the ACT," that sort of thing. And the students feel they didn't do well because they didn't know what the words on the exam meant. Especially in the science area. More traditional teaching of science would teach these words more effectively.*

One world scholar who has caught the eye of teachers (and the trainers of teachers) is Jean Piaget of Switzerland. Piaget has meticulously analyzed certain stages of cognitive development of youngsters. Apparently without his intending it and perhaps unfortunately, teachers have become persuaded that their teaching should concentrate on the levels youngsters have not yet attained. A teacher at one CSSE site complained:

> *The system (here) is not increasing the number of people who reach the level of formal operations. Those who do are achieving it on their own. It's at 25% and it should be 85%.*

There is no research evidence that the best thing to do for a child who is slow at reaching (or somehow prevented from reaching) a certain cognitive stage is to concentrate on attaining that stage. The predominant thinking of cognitive growth and education by consultants to schools these days apparently has been to identify deficits and teach for them directly rather than to proceed with what might be considered a well balanced set of experiences.

Stressing the importance of experience, a few teachers told us things like:

> *I would not object to carrying a biology class to my farrowing pens when sows had pigs because I could stand there in dirty clothes and teach one heck of a sight more in a few minutes than you can teach out of a book in a long time.*

and

> *If you can't have on-the-job training, where they're paid for it, then simulate it as close as you can. You can do a fair job in that shop, but you can do a much better job out of that shop. We have built buildings all over this county with our carpentry and masonry classes.*

Statistical analyst Beth Dawson, visiting our Pennsylvania site, reported on one open classroom middle school (see p 10:24):

> The opportunity to do, to experience, was frequently mentioned as one of the best qualities of this school's curriculum. . . . the school store incorporates a unique philosophy related to "learning through doing". . . a 7-minute closed circuit newscast goes daily to each classroom.

But these teachers and schools were exceptions. Some harassed teachers spoke wistfully of such activities. Most dismissed them as frivolous. Most were persuaded that it made much more sense for children to learn what others had already learned rather than to learn it tediously and discouragingly each by oneself, and this persuasion essentially excluded all instances of self-learning of key problems, ideas or experiences. In ARCHIPOLIS our observer was startled to hear the teacher ask, "How do we learn?" and the class chorus back "We learn by reading." (p 9:9)

We asked for the reasons for this shunning of experience-based curricula. At least two major factors seemed to be operating. The most deeply entrenched factor seemed to be a strong philosophical bias toward the authority of "book learning." As we conclude after careful review in Chapter 17 (on socialization) most teachers believe children should be "disciplined" to learn expeditiously from printed materials. (See the GREATER BOSTON case study, p 11:30, and the FALL RIVER case study, p 2:20.) Formal mathematics teaching in elementary school is necessary to prepare students for junior high school. (See the RIVER ACRES case study, p 1:37). A physics teacher in RIVER ACRES (p 1:152) commented,

> *Our whole science department is fed up with it [PSSC]. Investigation process wastes so much time. We end up telling them what they are looking for anyway; they cannot "pull it out."*

The other major factor in the movement away from an experience-based curriculum is that teachers who attempt to provide direct experience of the phenomena are often confronted with difficult and frustrating problems. One problem is a

lack of training in arranging "experiences" in the difficult "real world." (See the VORTEX case study, p 10 16, and the FALL RIVER case study, p 2:39.)

Proper training, however, does not eliminate the frustration. Preparation for laboratories or other hands-on activities takes time to collect, organize, set-up, take-down, clean-up, and store the materials needed for doing the activities. Most teachers do not have the time. Two elementary teachers sought out a site visitor in FALL RIVER to tell him that they enjoyed teaching science using "hands-on" materials, but given all the other work that was demanded of them, they just could not afford to spend the preparation and class time that it required.

Learning by Experience. With or without regret few teachers are engaging students in learning by experience. Most accept the equivalence of learning by experience and learning through instructional media (mostly the printed page) and see the student as getting greater volume via the media because of the efficiency involved.

If there was any celebration of experience without performance goals in the case studies, it may be epitimized by Rob Walker's description of a presentation for children at the Museum of Science in GREATER BOSTON (p 11:28).

> The machinery is impressive: a sound synthesizer coupled to TV monitors, street size ultra-violet and sodium lamps, a double bank of colored lights some ten feet tall triggered by different sound frequencies, and a burglar alarm which detects movement by ultra sonics. (One volunteer comes on stage and has to creep up on a balloon and burst it without setting off the alarm. To help her she sees her movements graphed on a TV monitor. Then the monitor is switched off and the children have to shout directions to her from another monitor only they can see.)
>
> High frequency sounds show, to the children's delight, that they can hear things their teachers can't hear. "Just learn to talk in those sounds and you can talk all day in class without your teacher hearing you," suggests the programme presenter.

However, others may prefer Lou Smith's description of sixth graders on a week-long camping trip organized by the ALTE school district as a part of their outdoor education program. As Smith described it (the incident as more fully described starting on 3:51 is more informative than this brief excerpt):

> As we were roaring off on the van, going to the canoeing area, we went by a big turtle on the road. The driver stopped and one of the teachers got out and brought it into the van. It was going to be added to the collection. Later we found another. All on the way to canoeing. The kids were interested and played with the animal, watching it as it moved. . .

> While we were on the lake in the canoes, we spotted a number of water turtles with a much flatter back and body, sunning themselves on logs and stumps. In one spot there must have been a half dozen. The kids all paddled over to have a look. I was surprised that the turtles were not skittish. The kids got up quite close before they took off.

However, not many teachers appear to be very happy about devoting too much time to these sorts of experiences that are delightful but not directly productive of demonstrable learnings. They are considered very good for a change of pace, and one principal said he hoped all his teaching staff would get involved in the outdoor program because some of the children who did rather poorly in class were outstanding in the outdoor situation.

Students, as well as teachers and parents, know that natural unscholastic types of experiences should not dominate their learning. Tony, the accomplished science student in PINE CITY (p 6:31) did not belittle the role of the classroom.

> I asked Tony if he felt he could learn more about science by staying at home and exploring the woods and creeks. His answer, surprisingly, was no, a lot of science you couldn't learn from experience, at least in this part of the country. He felt science was not just about the immediate environment, but provided a window on a wider world. One of the things he liked about science was that it did provide some escape from the constraints of his limited world. He summed up his feelings saying: "Math is just a bunch of numbers, English is a bunch of words, but science is different. Science changes, you move on, you don't stay on one thing."

The Mystery of Learning and Forgetting. Even with the understanding that comes to teachers with experience, much that happened each day in classrooms had an air of mystery about it. Who knows how Harold managed to learn that skill? It is impossible to believe that Linda can no longer do "Sevens," but she cannot, and she says she never had them. A RIVER ACRES teacher put it this way (p 1:106):

> *When the light goes on for a kid I ask, "What did I just say? Tell me, so I can use it next period." It doesn't work next period of course. Today we were doing the expansion of binomials. We had done the usual background work on this. So I was giving them Pascal's triangle and some of them caught that rhythm just as soon as I put it down. Others were saying what, hey, where are those numbers coming from? So, we work on it together and alone. We lost some of them and came back and did some more--then one said, "Oh, I get it!" Then a couple others. I don't know really how that happens.*

In the RIVER ACRES case study Terry Denny discussed "Great Mystery" of "forgetting," (p 1:36). It included the vast differences between classes in different years, "analogous to the good and bad years for wine with school reasons not being so obvious." A teacher there said: (p 1:113)

> *I had no preparation to deal with level 4's--even 3's. (The two lowest tracks in junior high school.) I just never knew how hard it would be. Times and kids are changing. . . . Part of it is the frustration, the extreme disappointment; you need preparation for this. You've taught them, they've known it, they've been tested on it; they've succeeded, and two weeks later they don't know it anymore. That kind of preparation would be awfully hard.*

And a math teacher added (p 1:37):

> *Except for the "block 1's" (35 of 140 third graders) all third graders know one thing perfect in math one day and the next it is gone. . . I mean GONE. (She has all the block 2's--average kids). It is a week, year to year experience. I have had children for three years in a row. Knows his facts up to 19 in addition beautifully in May, comes back in September and he's forgotten them. I mean zero retention. Now what I want you to know is that ALL the kids except block 1, and some of them too, have this mysterious "forgetting disease." Last week I had the "2's" borrowing and carrying and I was so happy and we were all dancing. After Thanksgiving they came back and acted like they had never heard the word "borrow." Borrow!? Teachers live with this. They see it every day and get used to it, so we don't talk about it. But it's there teaching math; day to day.*

The interaction between a PINE CITY mathematics teacher and his students (p 6:37) concerning a new kind of procedure introduced when some members of the class were absent illustrated the elusiveness of the learning experience:

> *"But some of them are away," a student remembers. "This is so easy they'll soon catch up," jokes Mr. Williams. "So tomorrow we can sit back and take it easy," someone replies.*

But at the end of the class Mr. Williams returns to the point:

> *"Don't tell the others what we've been doing because they might think it's difficult. Remember how important first impressions are. . ."*

We hide the mystery partly by talking about skills, entities that seem to have body to them that flourish or weaken, entities that when talked about enough seem to be real. Teachers did not seem to have a good idea of what skills were, only that they result in performance, only that they are important.

Many teachers have had enough of mystery, of uncertainty, of vague promises and unreal expectations. The charm had left the mystery, the parents were angry, and something solid and beyond challenge was attractive. The teachers were not happy about the students' inability to perform (WESTERN CITY, p 7:33):

> *In my classes I have to lecture. Most of my students don't know how to read or they are reading well below grade level. Consequently, I have to resort to lecturing and using worksheets.*

Why can't they read? The teachers did not know. Why won't they study? The teachers did not know. Why can't they remember what they knew last week? We just do not know.

Many of the problems were attributed to low native intelligence. Many of the problems were attributed to low motivation. But those are the problems that schools should have been most ready to deal with. Highly intelligent, well motivated children were learning with only minimum help from the schools. The more influential families wanted teachers who would pay attention to their children. "Let special education remedial teachers take care of the others." But the courts say put them all together. And the special education teachers are specialists in cognitive skills, not about education. So the mysteries of teaching and forgetting are perpetuated.

What educators were doing in the face of these mysteries was to submit learning situations more and more to their control, that is relying more and more on technology. Gordon Hoke told about a mathematics laboratory in VORTEX (p 10:12):

A group of fourth graders began to enter the room. I watched them work with the wide array of both "hard" and "soft" learning aids, recalling a K-1 classroom of several years ago at the University of Hawaii's Laboratory school where I first saw children functioning extremely well with technology. Students there paired off and assisted one another, as a few did in the VORTEX setting. But the effects of Joseph's operational philosophy were apparent: students were working mainly on an individualistic basis. A few were counting on their fingers, and I asked Joseph: "If you had the space, would you want an abacus here?" "Definitely," he replied, "There's a difference in 'hands-on' approaches, and you can see the need for more manipulative experiences."

A girl displayed very low levels of frustration tolerance, and I commented to Tory, the aide. "Yes, she doesn't have much patience," Tory acknowledged, "and the older they get the more you see that kind of behavior. That's why I dread going to School X to pick up their sixth graders." I made that trip with Tory, and the reasons for her uneasiness were clearly evident. The same activity raised other questions that must be faced in the development of special programs.

We drove about six blocks to X where Tory parked her car. The pupils were on the verge of having a "milk break" and some were angered by the interruption. Their teacher promised they could have the milk when they returned. The bus then transported us back to the Lab where students were to spend approximately 35 minutes. "Some days the buses aren't on schedule and we lose a few minutes," Tory said.

Once in the Lab, students rather quickly--surprisingly fast, in my estimation--began working. A few words or gentle shoulder taps from Joseph calmed 2-3 boys and Tory explained to a girl: "If you don't watch what you're doing, the recording won't stay in time with the problems." It was a productive session, almost all pupils finished tasks assigned by their individual folders and were checked-off by Tory or Joseph. We reassembled for the return bus, a different one arriving from yet another corner of the district.

Getting students ready to learn is a crucial matter, particularly those who have a history of learning "failures." Joseph and Tory performed nobly given the constraints of time, space, and scheduling. Their efforts underscored the importance of people who link children to the technology. The role of instructional personnel who function at that point where learners interface with machine appears certain to grow in significance. My own children have had negative experiences in similar circumstances, and it was a pleasure to watch the scene described above. But the "paperwork" often associated with such efforts remains a formidable consideration, and Joseph and I discussed the need for computer-managed systems. The task of blending lab

> activities with classroom routines also must be faced. Joseph's caution that the Lab experience is strictly "in addition to" does not eliminate the classroom teacher's resistance to interruptions nor does it negate the pupils' need for some type of synthesis.
>
> At the moment, media-oriented programs, such as the Math Lab, stand out as isolated enclaves, analogous to the Language Labs spawned by NDEA legislation of the 1950s, a promising and undeveloped aspect of public schooling not yet integrated into a new conceptual and operational mode of education.

The technology of instruction promised to reduce the mystery of learning and the mystery of forgetting, partly by greater individualization, partly by more efficient encounters with the problems, partly by eliminating those learning tasks which did not accommodate to the technology. Central to the technology of instruction was the technology of testing--to be discussed next.

TESTING TO MEASURE STUDENT ACHIEVEMENT

Testing seems a most natural part of the curriculum of schools. No other institution uses tests to the extent educational institutions use them. The mention of testing brings to most people's minds only one institution: schools. A science class in PINE CITY had elements which many citizens of this country would recognize as part of their own school experience (p 6:34):

> Mr. Rodgers starts the physiology class with a spelling test. He reads out eleven words (examples: "autonomic nervous system," "proprioceptors," "neurolemma," "myelin sheath," "excitability," "summation"). Ten minutes later he collects in the papers without comment and begins to check some work the students have already completed. Each student is given a turn to answer the questions. It's a bit like a quiz. Mr. Rodgers reads out the questions and if they get five in sequence correct they score a point. If they get it wrong or can't answer it passes on until someone gets it right, and collects a bonus point. Sometimes the questions go round the class (with mounting excitement) until someone scores. Almost all the questions (which come from the textbook) concern terminology or definitions.

In order to know how well the students were doing the teacher would "test" them.

In the literature of educational psychology, testing is a rather technical and decontextualized subject. For fifty years measurement specialists have held their discussions on test validity, test reliability, item analysis, and differences among types of tests. Many teachers have taken courses in testing

from these specialists, but the technical aspects of testing remained outside their technical expertise. At the CSSE sites teachers seldom talked about the technical aspects of testing.

When teachers talked about tests it was in terms of <u>their</u> concerns: Are students attending to my lessons? Are these students learning as well as we expect them to learn? Does my teaching match the expectations for teachers in this school and community? Will community and parents view my questions and grading systems as fair and impartial? Concerns like these arise out of the teacher's particular classroom context. Louis Smith, site observer in ALTE, described some of the elements of this context (a portion of which is quoted here; p 3:90):

> On occasion in observational studies the presence and recurrence of little items jell into patterns and conceptions of larger significance. Consider for instance the presence and recurrence of these items across schools, levels, disciplines, and departments:
>
> 1. in most classrooms, a section of the blackboard with assignments for each day of the week;
>
> 2. teachers' grade books literally full, cell by cell, home to be graded (in the evening) or into class to be returned (in the early morning before school);
>
> 4. lab books full of red ink comments;
>
> 5. frequent classroom byplay around the question, "Does it count?";
>
> 6. reviews before tests, taking of quizzes and tests, returning and checking of tests;
>
> 7. in the staff room of one school, the presence of a small test scoring machine for rapid marking of objective tests;
>
> 8. long faculty discussions and memos defining "cuts" and "absences," clarifying responsibility among teachers, administrators and clerks; and
>
> 9. sitting in offices and staff rooms as teachers talk in detail with parents, re: a child's work, both its quantity and quality.

Lou Smith drew our attention to several lines of meaning in these items:

> 1. the teachers play a dominant and influential role in pupil learning;
>
> 2. students are expected to learn, assignments are made, products (homework, lab books, tests) are monitored carefully; and

3. points accumulate into semester grades and grades into class ranks.

Such a context is a performance-oriented, record-keeping context--naturally suited, it would seem, to the technology of testing. But what has been the dominant form of testing over the last fifty years is recitation, an informal kind of testing rather than examination, a more formal kind. Smith continued:

> Finally and perhaps more importantly, the items can be placed up against two more general positions in the literature. First, in a classical review of classroom questioning, Hoetker and Ahlbrand* conclude regarding "the persistence of the recitation":
>
> *The studies that have been reviewed show a remarkable stability of classroom verbal behavior patterns over the last half century, despite the fact that each successive generation of educational thinkers, no matter how else they differed, has condemned the rapid-fire, questions-answer pattern of instruction. This opens a number of interesting avenues of inquiry. What is there about the recitation, for instance, that makes it so singularly successful in the evolutionary struggle with other, more highly recommended, methods? That is, what survival needs of teachers are met uniquely by the recitation?*

Reflecting on activities of their classrooms, CSSE teachers were primarily concerned about two things: how to get students to perform well and how to live up to the expectations other people had of them as teachers. Satisfying the one did not always satisfy the other, and all people did not have the same expectations. Both recitation and examinations had been designed to measure student performance, to help establish and maintain certain skills. Recitation stood for personal involvement and judgment; examinations stood for quality control and impartiality; all part of the expectation of a competent teacher. The different forms of testing can be viewed as symbolic of and instrumental in the establishment and maintenance of a proper classroom. As the following discussion will indicate, this is particularly evident in the case of teacher-made tests, the most prevalent type of formal testing used in the CSSE sites.

Teachers Learning about Learning. One way teachers learned about how much and how well their students were learning was through homework. This scene in WESTERN CITY was not atypical of a mathematics class (p 7:30):

> . . . there were 24 students present. The teacher made some general announcements and then proceeded to discuss the homework from the day before. Proceeding slowly with the

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*James Hoetker and William P. Ahlbrand, "The Persistence of the Recitation." American Educational Research Journal 6 (March 1969): 163.

> explanations the teacher repeatedly asked if there were any questions. After correcting the assignment, the papers were collected. The teacher proceeded to explain the problems and their solution. The teacher assigned six problems as homework for the following day. Since there was a little time left in the period, the students were told they could start on their next day's homework assignment.

Teachers were idiosyncratic in their methods of finding out how much their students had learned. Some relied heavily on formal closed-book quizzes and examinations. More relied on informal recitation, some expecting or even requiring the answer to come as a read-aloud quotation from the textbook. Others held games. Others used worksheets, some elaborately packaged by commercial distributors. And still others were casual and conversational. All brought the teacher the opportunity to review the skill or understanding or experience of the learner.

Of course it was uncommon to speak of all these feedback solicitations as testing. A teacher usually reserved the term test for something that would be done independently, from memory, and with the expectation of being graded. Lou Smith observed that in ALTE, of the tests he found, "all seemed tied to the broad goals of excellence," (p 3:93). Finding out about student learning was seen as essential to the maintenance of standards. Teachers were quick to mention the shortcoming of tests, and often seemed to take little notice of their results, but were intent upon raising the standards of learning in their schools, and used tests to help them do it.

Most of the tests used in the classroom--as opposed to workbooks and exercise sheets--were developed by the teacher, often using questions from another test or from the textbook or teacher guide that accompanied the textbook. These teacher-made tests were much more closely attuned to what actually occurred in class and as part of the laboratory work or homework than district's objectives-based tests, the publishers tests, the criterion-referenced tests or standardized tests--and to be sure, there were very few of these more formal instruments to be seen in any of the schools.

Teachers were committed to their own testing practices, though often unaware of how arbitrary (even when very good technically) their tests were. They often were puzzled by the results. A teacher in BRT said (p 4:9):

> *From my own tests I would guess at least half the class has really understood what I've taught. Maybe another quarter are borderline. I'm talking about biology now. It's very discouraging sometimes. When I give a test I have lots of A's and B's, a few C's and lots of D's and F's. I don't know whether it's me, the subject, or what. Other teachers don't seem to get this distribution. In chemistry and physics the results are different because the group is more select. They're mostly A's and B's.*

The results they got from tests usually paralleled the results they got from recitation and other interactional forms of quizzing. Student learning was teased out in various ways, even as indirectly as quietly listening to students plan a project or help each other with an assignment. It was not unusual to find that the same students who raised their hands first helped other students most often, had the most detailed answers in recitation, also made the highest marks on the examinations.

From this fact (across the years and across the country) arose one of the great contentions between teachers and testing people. Noting the high correlation (across persons) between performances on different kinds of testing, psychometricians maintained that the format of testing should be based on technical rather than educational characteristics. They demonstrated that they could get the most dependable indicator of who had achieved the most (and, more important to them, who were most likely to achieve the most in future opportunities) from tests that had numerous independent items and were objectively scorable. The multiple choice examination became their standard instrument. Many teachers, students, and others (and many testing people as well) heard them to be saying that most intellectual attainment is of a single kind, a kind that is best represented by the response to a multiple choice item. Many of our CSSE respondents were quick to argue against that conclusion. A young teacher in GREATER BOSTON, noting that the gains in tests scores in this school were not dramatic, believed those scores to be a poor indicator of the success of students and teachers. He said (p 11:35):

> *I don't want to make any grand claims for the system. I just know at this time, with these students, in this school, it (the instructional system) works.*

He amplified the point by asking how success can be judged or measured and what kinds of comparisons make sense.

> *Compared to what went on before the system, compared to what we could do without it, compared perhaps to what goes on in other classes, I have no doubt that it is worth the money it costs. How do you measure it? Against how well children read? Against their attitude to reading as a whole? Or against the chances of them cleaving someone's head in?*

A student in PINE CITY remarked on the inadequacy of tests, even teacher-made tests, in representing what students have learned (p 6:38):

> *Students often learn a lot more than teachers realize. I don't see how you can honestly test a student on his knowledge when it's really the teacher's knowledge you are testing. The teacher gives what he knows and then gives a test to see if the student knows it. To be a teacher he has to know more than the student to start with, or the student would be teaching the teacher. I see giving tests as a way of learning but not as a way of grading a person. . . . They gave you credit for the*

> *way you did things rather than for the answers. Coach Williams would go through a problem step-by-step and give you credit for the [steps] you got right. If it wasn't for that, no one would have passed Math!*

The idea that testing really tells what the teacher knows and has taught has occurred to many management-organization type administrators and assessment specialists, but was quickly dismissed by essentially all of the teachers who talked to us about testing. The technical limits of testing and the non-school determinants of student responses were seen to be too strong. (See BRT p 4:9 for the way one teacher put it.) The teacher component in test scores was seen to be small. There is essentially no reference in the case studies to the use of tests to evaluate teachers or curricula. Lou Smith's survey of instruments in ALTE (p 3:93) yielded a variety of tests that could have been used for that purpose:

> In the course of the semester we collected a number of "tests" used in different parts of the curriculum. More systematic accounting of what the pupils are expected to know would have tied down the intellectual substance of science education. We have excerpted into Figure 27 a few items which capture the flavor of some of those expectations. Some are "fun," some involve intellectual skills, some tap developing concepts and some pull quite specific information. All seem tied to the broad goal of academic excellence.

The most common comment about tests from teachers was that they did not tell anything the teacher did not already know. A teacher in RIVER ACRES wondered whether they were worth the psychic costs (p 1:65):

> *Kids see more than we measure either by our standardized tests or by our letter grades. The sixth grader <u>wants</u> to do more and feels inadequate of what he has not learned. He is mortified. He doesn't need to be embarrassed publicly.*

As we talked to curriculum coordinators and teachers it became clear that only the few who could work extensively with individual children had an idea of the <u>knowledgability</u> youngsters had of particular science topics. Tests available commercially or through government agencies or university projects were not seen to be capable of providing other than a very narrow review (via criterion referenced testing) or extremely general indication (via commercial achievement tests). A teacher who spent an extra two weeks on weather or on world markets and had reason to believe that her class became very well informed could not expect to have this knowledgability show on any available tests.

This was not a situation peculiar to the sciences. Tests of subject matter content, to the extent they ever existed, have been replaced by tests of skills in all the subject matter areas. It has not been so much a problem in mathematics because the emphasis there has traditionally been on

computational operations and other skills and less on conceptualization of content. But it has been a problem for those who would like to know what individual students understand about physical and social science topics.

This is not to suggest that many teachers were interested in taking inventory of knowledgability (e.g., for using previous acquaintance with topics as a basis for new assignments). It is to suggest that understanding of specific science topics is not being inventoried by any available testing, including the National Assessment of Educational Progress. Given the immense scope of new knowledge available to the ordinary citizen, the scope of understanding science topics is not known, nor even whether or not the contemporary youngster is more or less "scientifically literate" than the youngster of a generation ago. These inventories and comparisons may not be important knowledge, but because many tests are used, it is sometimes incorrectly presumed that we can make decisions on such knowledge.

Teachers Telling About Learning. Teachers have the obligation to keep records of the academic progress of youngsters--and to keep them and their parents informed of their achievement. There are many informal ways teachers nave of acknowledging responses good and poor. The formal way is largely the grading system.

Attempts to standardize grades were underway in several schools. In RIVER ACRES a "fine-grained" district-wide grading policy had been recently adopted. As Terry Denny reported (p 1:11):

100-93=A
92-85=B
84-77=C
76-70=D
69-00=F

> It has its detractors and there is a small minority of elementary teachers who would abolish grades completely. "We have to. Its our policy. I'm against them. Social promotion means a child should be provided for. A good society would promote good education for all children." For the most part, though, teachers and parents find the grading policy and practice to their liking. Notable exceptions (occur) when grading creates problems in the context of achievement or ability grouping.

As noted the policy seemed to hide a number of differences of opinion. Each teacher was obligated to use the common grading system at that school, but most were free to add additional informaton to the grade reports. Different teachers

continued to interpret the grades in different ways.* One teacher in FALL RIVER said (p 2:17):

> *"I carry on a reality therapy in my classroom, like Glasser's Schools Without Failure. I try to base my class on that. That's where you make a kid responsible for his actions. . . Responsible behavior builds a success identity. . . . . I establish for my success identity that no person will get less than a C in my class if they have demonstrated responsible behavior in the laboratories and have tried, on all the tests to do their best. . . . In a majority of cases, this is successful. . . . . I've removed the pressure of the tests so they do better on the tests. You can't get an accurate picture of what the kids know with all the pressure and anxiety that's built up from the tests."*

Measurement specialists continue to talk about the technical inadequacies of grades, but the teachers of our CSSE schools did not. When they referred to grades they considered them as fixed, part of the system, causing some problems but largely necessary, compatible with the student's and parent's concern about scholastic achievement, and consistent with the administrator's (and increasingly the legal office's) demand for proper ledgers.

Often the talk turned to the problem of keeping grades "in perspective" (p 4:15):

> Their grade--that's all they think about. Getting through that test and this test. I would hope this isn't true, but that's the feeling I get from them.

Terry Denny, the observer in RIVER ACRES, (p 1:89) also noted the emphasis students gave to grades.

> Regardless of the level, the shared goal of the students in science is "to get a good grade." Students in levels 2, 3 or 4 (which have 95% of the students) do not say they are in physical science or biology to learn something substantive about the field. The reasons for getting good grades were several -- but grades are the thing. Level one students did talk about science, about their interest in it -- and about getting good grades. The competition for getting good grades appears to be considerable in the upper levels.

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*See Louise W. Cureton, "The History of Grading Practices," Measurement in Education 2 (1971).

As in John Ogbu's study of schools and community,* some parents were suspicious of teachers grading practices. Visits to schools and calls to teachers were made by some parents to obtain reassurance of the teacher's sensibility and impartiality. The teacher usually would turn to tests, exercises, and work samples to explain the grade, but the exact rationale of the teacher's interpretation remained unclear.

Although not one of the pressing education problems (except in an occasional instance) and although not an obstacle to providing good instruction in science, math and social studies, grading procedures in schools were complex and problematic. Various people needed to know about the progress of students. Various decisions had to be made, and basing those decisions on academic grades however questionable, had some merit and custom on its side. The current efforts being made to improve the quality of the information contained in tests scores and grades were not encouraging. The greater the effort the greater the tendency to isolate the simpler and less meaningful aspects of an education as the things to be tested for and graded. From what we heard in schools around the country, a happy solution was not in sight.

Other Uses of Testing. One of the original intentions of the CSSE staff was to study the relationship between the use of standardized achievement tests and other observations of student learning. This aim was sidetracked because none of the observers indicated much of an interest in probing the question and at none of the schools did we find standardized testing to be much of an issue.

At the time of these visits the popular press had given great attention to the fact that CEEB college aptitude test scores and other test scores had (for the nation and for most local districts) continued a decade of slow decline. A distinguished panel**found the decline attributable to a number of conditions, none of them singly influential, several of them suggesting a deterioration of the academic attitude within the schools. The teachers and citizens we talked to seemed little interested in the score decline per se, were quite interested in various signs that the academic attitude was deteriorating, not persuaded that the quality of the school offerings was diminishing, and much more concerned about local and individual problems of motivation, performance, and obstacles to the conduct of "ordinary" instruction. The national picture was just not accepted as indicative of problems locally.

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*John U. Ogbu, The Next Generation: An Ethnography of Education in an Urban Neighborhood (New York: Academic Press, 1974), pp 95-96.

**College Entrance Examination Board, On Further Examination, Report of the Advisory Panel on the Scholastic Aptitude Test Score Decline (New York: 1977).

In WESTERN CITY site observer Rudy Serrano (p 3:47) reported that placement in math "levels" was based almost entirely on standardized achievement test scores. Similarly, in ALTE (p 3:47) placement in math tracks was influenced by standardized achievement test scores although parent opinion was given precedence when it conflicted with test scores.

In an example of the symbolic value of standardized test scores, the junior high principal in BRT (p 4:3) used tests to justify his claim that in spite of small size, his school provided as good an education as any other school. We thought that school people might be discouraged because tests and other data were not sufficient to maintain public support of their programs. In our survey we asked about the claim:

Our school district does not seem to be able to obtain objective evidence of student achievement that would persuade a skeptical visitor that the science teaching here is effective.	and found these proportions agreeing with the claim:	
	Administrators	30%
	Curric Coord's	41%
	Teachers	26%
	Seniors	26%
	Parents	35%

Large numbers sought better evidence but for the most part the respondents seemed to be saying that they did not need better evidence than they had to indicate the effectiveness of their science instruction.

Teachers, administrators and others at several of the sites were dismayed at the amount of time scheduled by the district to be spent testing for one purpose or another (in addition to the testing of various kinds already being done by the teachers and counselors for their purposes). In ALTE and ARCHIPOLIS site observers noticed that testing took place frequently in many classes. Nevertheless, teachers did not appear to have much taste for the information tests could provide about individual student problems or problems with their own teaching. This was consistent with reports of Hotvedt and Hastings et al.,* who found teachers did not value the information provided by tests as highly as the judgment they could make based on their own observations in the classroom. Scheyer** concluded that teachers make little use of test results

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*Martyn Hotvedt, "Teacher Uses of Testing" (Paper delivered at the J. Thomas Hastings Symposium on Measurement and Evaluation, Urbana, Illinois, January 30, 1978) citing particularly the work of J. Thomas Hastings, Philip J. Runkel, etal, "The Use of Test Results" (Urbana: University of Illinois Bureau of Educational Research, 1960).

**Patricia Scheyer. "Test Results Revisited," The Cornbelt Education Review: A Graduate Student Journal, mimeographed (Urbana: College of Education, University of Illinois, 1977).

in making instructional decisions. "Teachers see children in greater complexity than tests can measure," Scheyer noted. It appeared that, like grades, standardized tests provided little specific information to help the teacher make instructional decisions.

New emphasis on testing seemed to be emerging in some sites. There was widespread belief among district offices that instruction could be made more effective if a highly-structured, hierarchal program of study were devised, as reported in Chapter 14. When math supervisors and teachers were asked about the claim:

Students have been promoted without knowing basic mathematics

sixty percent of the supervisors and ninety percent of the teachers agreed. They sought ways of keeping students out of instructional situations for which they were not prepared. More testing seemed to be needed. We found some teachers optimistic about the diagnostic uses of testing and some frightened by the possibilities.

In some sites scores seemed to be used whenever decisions about pupils had to be made. Perhaps this reflected new attitudes about the importance of documenting learning with test scores, or perhaps it reflected the development of criterion-referenced testing. As indicated in Chapter 14, if this is a general trend in education, it deserves further study. A criticism of testing noted once or twice in the case studies was the possible impact of standardized testing on the curriculum. Substantial attention to testing appeared to foster a distinction between instructional time spent on the more narrow range of achievements measured by the test and instructional time spent on achievements not so well measured by the test. One very obvious example was the effect of standardized tests in reducing the amount of practice students have in composition; this was mentioned by a teacher to a site visitor.

> *We've gotten into a testing routine, which may be very fair in terms of ranking, but it superseded the old, written essay type of system and one of the consequences of that, it seems to me, was that we used to accidentally teach people a lot, or help people learn a lot, because they had to write out what they thought. I sometimes wonder if we haven't harmed their learning in the attempt to be fair in rank-ordering the students.*
>
> *Maybe the whole idea of objective tests has taken away from the student the chance to learn a lot that you do learn when you have to sit down and write it out.*

With such criticisms, why then would the use of tests, both teacher-made tests and standardized tests, increase?

An answer may be found by examining the functions of tests from professional and institutional perspectives. Although formal testing did not seem to satisfy much of the teacher's need for knowing what the student knew, testing did seem to assist in socializing students and maintaining control over them. In VORTEX the pedagogy was more formal than in the other sites; there, except in the one middle school and the individualized remedial reading program, both of which, incidentally, were controversial, testing was limited to a few teacher-made tests each grading period. In places where instruction was less formal, perhaps because of declining student interest, testing was an important means of socialization and control. Testing was relied on to motivate the students. The information provided by tests seemed mainly used in the justification of past decisions and the allocation of further opportunity.

STUDENT MOTIVATION

Student motivation was seen as a major problem in most of the sites we studied. One BRT teacher identified it as the major problem:

> *My biggest complaint about teaching is the frustration thing. It comes from motivation. I don't know if it's me or them. I don't understand why kids are not more motivated. Part of the answer must be in me, but it's hard to look at yourself and see other than what you want to see. (BRT 4:24)*

The frequency with which we heard such remarks across the country indicated that student attitude was a prime concern. Mary Lee Smith found it to be the most common professional topic in the teachers' lounge at FALL RIVER (p 2:8). One site visitor at ALTE heard:

> *They're dead now. Withdrawn.*
>
> *In the last two or three years, there's a lot less enthusiasm.*
>
> *You try to get them involved in the problem, and I can't get them involved anymore. They just sit there. I ask them a question--a very simple question--and I can't get anybody to answer.*

In PINE CITY (p 6:15):

> *Most teachers agree that the key problem is motivation. In every class there are one or two, perhaps sometimes it's more, who just sit there, and whatever you do, however hard you try, it's just really difficult to reach them.*

Administrators were also concerned about the behavior and attitudes of their students; a PINE CITY junior high school principal identified it as one of his major concerns, the other being the efficient running of the school (p 6:11).

And when we found a younster whose motivation was exemplary other doubts came to our minds. In Rob Walker's case study of GREATER BOSTON he described Helena (p 11:38):

> Helena seems unusual amongst the students in believing so strongly that school and education have something to offer to her. It's not just the job prospects she values, but the process of Education itself. "I like to know things," she says, "when someone uses a word that no one else understands, but I know what it means, then I feel good. I like to be knowledgeable, to be someone that people know they can ask when they want to know something, whether it is the speed of light, or whatever it is."
>
> . . .
>
> Helena is articulate and headstrong, and some of the other students seem to find her a little overwhelming. She needs the attention and praise of adults to support her moral stand against her peers. The question she raised for me was whether the students who committed themselves to the explicit values of the school were those whose motivation stemmed to some degree from their alienation from their peers. Are those students who best succeed in academic terms often those who feel themselves misfits amongst other students?

The problem of academic motivation is not a simple problem. Some of the youngsters and teachers least concerned about achievement may have been making more sense than the rest.

But the norm was: low student motivation is a serious problem. The lack of academic motivation showed up in numerous ways. One was the refusal to even be in school: Rob Walker reported that in GREATER BOSTON, on any given day, about 70% attendance in the high school was to be expected. A more subtle expression of motivation (or rejection of school) was a passive non-involvement, shown in the incident in which a FALL RIVER teacher chided a student for not paying attention to the question and he responded, "I heard the question; I just don't care." (p 2:12)

Students were said to have their own idea of the purpose of school. One high schooler in FALL RIVER talked about Happy Days and American Graffiti,

saying many of his/her classmates felt that school should "be fun, the happiest time of your life." (p 2:74) During our site visit, a junior high school teacher in Texas described a similar "social" role for the school, as far as her students were concerned:

> *Yesterday my students came into (class) to visit! And anything I had to say was strictly secondary to what they were there for. . . I finally got tired of calling them to attention four times and trying to address the backs of their heads. And I let them know if they could not listen, perhaps they could read the instructions from the blackboard. . . It upset me a very great deal to have to resort to that.*

A BRT high school social studies teacher (p 4:43) said:

> *It's almost as though we have to prove why we're here, why we're functioning. (They as much as say:) "What makes you think you have anything of value to teach us?" You know, I get the feeling many times that I'm on the defensive as a teacher. It isn't enough that I stand up and say, "This is your assignment." I almost feel as though I have to prove it, to prove that there's value in doing it, other than the fact that I just want them to do it.*

Across the country, we gained a clear sense that many students will not accept the word from school authorities that "it's good for them."

We observed a number of ways the schools attempted to change student motivation. First, the students were allowed a greater range of electives thereby giving them the opportunity to "find their own level." In some cases, the fact that a course was an elective raised academic performance as students who were more genuinely interested in the subject enrolled. An administrator in URBANVILLE told our site visitors:

> *We fully expected that the number of kids who took math at the senior high level would drop off (because of letting 9th graders take courses required for graduation) but this didn't happen.*

He said the grapevine kept enrollments up:

> *You can enjoy this class.*

On the other hand, during our URBANVILLE site visit we heard that the courses considered difficult attracted those who were status-conscious:

> I suppose many students sign up for calculus even when they're not motivated because they like to be in honors courses. There's a certain amount of ego attached, and they have a certain status being in the course. And some of them can get by comfortably without really putting out.

This sort of thinking, on the part of both parents and students, was described in both the RIVER ACRES and FALL RIVER case studies. If a class was perceived as "an easy grade," students not interested in working sometimes enrolled in disproportionate numbers. It created a major problem for the teacher and further discouraged more motivated students from selecting it. (See BRT, p 4:42, the description of the social studies program.)

Teachers reported trying to motivate the less able (or less willing) by making their courses "more relevant," i.e., relating them to every-day happenings. However, it appeared that understanding the adolescent well enough to know what is relevant is no easy task. One biology teacher told about including a discussion of Legionnaire's Disease in a lesson on infectious diseases, but found the students showing the "characteristic inertia." Such reactions arise partly from a lack of imagination on both sides. The adult is often unable to comprehend what will be of interest to the age group he/she is addressing. He/she is unable to get into their framework to the point of relating the subject matter to their concerns. On the other side, the student pleading for "relevance" is handicapped by a highly restricted view of what sort of background knowledge may eventually be useful. The attitude expressed by the PINE CITY student (p 6:38) was typical:

> *I knew by ninth grade I wanted to go into criminal justice so I found myself asking why Biology? It's a question a lot of students ask themselves. Why Science? And it's not a question the school really answers.*

This student clearly thought he was able to predict his own future well enough to decide what he could afford not to know.

A similar attempt to motivate the student has been by homogeneous grouping. One viewpoint we heard frequently was that grouping enabled the teacher to put together those students who wanted "to work" and to give them theoretically-oriented courses, while students who had less intention "to work" could be put in a more practical, applied version of the subject. (This policy is related to the view of science as an elitist pursuit. There is a good discussion of the pros & cons of grouping in the GREATER BOSTON case study, discussed in Chapter 12, (p 11:12 ff.)) Teachers who advocated this position justified it by claiming that students demand a "watered-down program" when they don't see the subject matter as having a direct pay-off. (See BRT, p 4:4)

But once students are in the lower track they may feel they have been branded as losers, adversely affecting their subsequent motivation. LaMar Miller has commented on this phenomenon:

> *All of the recent investigations seem to point to the fact that grouping often stresses a sense of failure in a consistent decline in morale and effort.**

This is what led some teachers in favor of mixed classes to say:

> *When I look at the problems schools face I think the only answer is for us to put our trust in democracy. (GREATER BOSTON, p 11:13)*

There was evidence that teachers and schools were seeking new ways of motivating students who performed at what they considered unsatisfactory academic levels. Individualized lab instruction was one such method. In GREATER BOSTON, the Reading Lab teacher said (p 11:35) that:

> *A lot of (the) success. . . (with the lab) has been with students who had got to the point where they wouldn't read along in class. . .*

In this setting, he stressed the value of what they learn for their own welfare. In addition, they were awarded certificates after 30 and 60 units of work. Observer Rob Walker suggested that the closed learning environment and the depersonalization of the lab seemed to be important for students who were operating there (GREATER BOSTON, p 11:35).

Peer review of classwork, rather than peer competition for teacher approval or grades, was another method being tried. The discussion of the GREATER BOSTON writing workshop (p 11:37) is illuminative. There peer review was highly informal, consisting of simply duplicating and distributing the students' writing on each given topic.**

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*Lamar Miller. "Testing Black Students: Implications for Assessing Inner City Schools," The Journal of Negro Education 44 (1975): 412.

**A more rigorous form of review, consisting of class discussion of individual work, has been claimed to be highly effective, see for example: Jean Seligmann and Sylvester Monroe. "A Teacher Who Gets Results," Newsweek, 12 September 1977, p. 67.

One BRT teacher we spoke to had attempted to develop a "communal spirit" in her class by instilling in each of her students the idea that everyone in the class had to participate actively for the class to be successful. A cooperative spirit in a classroom can be effective (as noted also in the GREATER BOSTON writing workshop), but our BRT teacher reported she was not able to "talk her class" into this mode of behavior.

Part of the problem is that the old-fashioned "carrots and sticks" are seen as no longer effective for many students. Unless the teacher changes and adapts a technique such as competition, she/he often feels that she/he has very little means of pushing students along. The grading system, the main in-school teacher-adult reward system, was being subjected to enormous pressures in the eleven school districts we visited. A part of its motivating value appeared to be eroded. (We discussed grades as indicators of learning in the previous section.)

However, an interesting effect that we noted during the course of this study was that both individual competition in classroom performance and the grading system continued to motivate the more academically able student. Lou Smith commented on the competition "for data, for pictures, for getting finished on schedule" (ALTE p 3:54) that was occasioned by the junior high school publication, "Images o our Community - Alte." He made frequent reference to the district's level of academic achievement and noted that grades had a real impact on the student since they in part determined whether the student would be recommended for courses which were prerequisites for the "heavier" academic courses and subjects. The fact that students were concerned about which grades count and which did not suggests that their behavior was influenced by the grading system. In the RIVER ACRES study, there are a number of references to student competition in the top levels; the teachers of the seventh grade science team describes it as "rip-roaring" (p 1:63). A Biology II teacher of level 1 students said (p 1:88):

> *They really put out because they want the grades.*

Observer Terry Denny commented (p 1:89):

> The competition for getting good grades appears to be considerable in the upper levels.

This apparent split between the two populations of students raises an intriguing question. Is it the case that these motivational methods have lost their "push" with the less willing/able academically, or is it the case that they never had much force with these groups and their ineffectuality is just surfacing? It may show now along with the widespread questioning of the core values of the academic establishment.

We found that the concern about a course grade did go up when the course might be failed, and the failing grade might prevent early graduation. As indicated in Chapter B, the older students need money, particularly for operating cars. They need to have a job. From RIVER ACRES we heard (p 1:118):

> *Kids are getting more and more jobs. Getting good grades is not as important as getting money. These kids want out. Especially level 3 and 4. . . . They aren't motivated to get good grades, to (then) get a good job, to then get money. They are motivated to get money today.*

Graduation is a goal because it will free those youngsters to get a better job (BRT p 4:42):

> *The sociology class has twelve students, most of the seniors. Mostly, they're slow students. They're looking for a course with a minimum amount of work. They're not interested in facts. They have opinions but won't go to the trouble to back them up with research. The one thing they're looking forward to is graduation.*

We have claimed that grades are motivating for some of the students. Such a statement is sometimes assumed to mean that grades are motivating because they signify that certain facts and concepts have been mastered. That kind of communication apparently was not what motivated the students we talked to. They did not think of themselves as mastering a certain body of knowledge, but more as mastering (and of course not mastering) those things being required by the teacher or the test. The knowledge domain was not a reality--it was a great arbitrary abstraction. The grade was a reality. We had a large body of evidence, from both the case studies and the site visits, that supported the idea that grades had intrinsic value to these youngsters. An ALTE high school science teacher discussing a shift of enrollment from Quantitative Biology to General Biology, was referred to in Lou Smith's notes (p 3:67):

> She attributes (it) to lower parent expectations and the fact that an able kid might get a 3 or 4 in General Biology but only a 2 or 3 in Quantitative Biology. The kids want the higher grade average, regardless of learning, for the college admissions race.

A BRT high school science teacher (p 4:8) said:

> *The students who take the upper level classes are so motivated to do well they can go ahead toward whatever their goal might be. Their grade--that's all they think about. Getting through that test and this test. I*

would hope this isn't true, but that's the feeling I get from them.

This differential effect of grades for the academically more- and less-able was reported by a RIVER ACRES junior high mathematics teacher (p 1:49):

For many of the kids the grade is the only thing that challenges them -- particularly the upper levels. I have half my level 3 class that is not turning in their work and the other half turn it in only for the grade. No grade, no work.

The middle range of students is seen as being indifferent to grades in districts large enough to have a highly stratified student body: In RIVER ACRES (p 1:65):

. . . Students in the top and bottom groups often share an interest in grades--more so than do the middle or "average" groups.

A junior high teacher in the same district made the following statement (p 1:89):

Regardless of the level, the shared goal of the students in science is "to get a good grade." Students in levels 2, 3 or 4 (which have 95% of the students) do not say they are in physical science or biology to learn something substantive about the field. The reasons for getting good grades were several--but grades are the thing. Level 1 students did talk about science, about their interest in it--and getting good grades.

We heard from many sources that students were reflecting their parents' attitude, which seem now less supportive of the schools than they were in the past. Negative ideas and feelings expressed at home about specific courses or disciplines showed up in school. (See for example the comments about mathematics, BRT pp 4:4 and 4:9. Occasional positive attitudes are also reported, such as the increased enrollments with the in-migration of "pro-chemistry" families in RIVER ACRES, p 1:92.) But in some places there is less push from home for student achievement and some instances we found pressure from parents for easier grading. Here's a statement we heard during an ALTE site visit:

Parents are different. They've changed in the last ten years. They want their kids passed to avoid hassels. They're no longer pushing as much.

We heard this attitude was to be found in teachers, too (RIVER ACRES 1:59):

> *We have lost our work ethic. School is for entertainment. Parents, teachers and children have lost appreciation for education. They want to be rewarded for performing any kind of work. Rewarding effort no matter what the quality of the product is.*

And (p 1:118):

> *I'll draw you a hard-edge picture of our incoming parents: They want straight A's for their daughters and good grades from their sons. They don't care where it comes from, what the kid learns. They want to see the grade.*

During an ALTE site visit, one of the math teachers spoke about the inherent dangers in motivational aids:

> *You have to be careful that the applications, the games, the motivating things you use are not being done for the sake of those things themselves. They have to be a vehicle by which these kids can learn basic skills.*

In the case of the grading system at least, the motivational aid was an end in itself. The case can be made, it seemed to us, that the grading system was motivating for students who want the approval of teachers and parents. It had very little to do with producing or selecting students who would have a deep commitment to science.

Vignette on Motivation. The ubiquity and severity of the motivation problem seemed to call for special efforts from support agencies. Ralph Tyler* had recently commented that:

> *many school problems are attributable to lack of motivation.*

He went on to say that technology can help with some teacher tasks

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*Ralph W. Tyler, response to "Via Technology to a New Era in Education," by William C. Norris, Phi Delta Kappan 58 (February 1977): 455.

> *but has limited value in others, especially motivation, developing confidence. . .*

That probably is too limited a consideration of technology, at least not consistent with the definitions used in Chapter 17.

But even in the most mechanized of instructional systems there may be answers to some of the motivation problems. In a case study of the PLATO computer-assisted instructional system* Bernadine Stake documented the strong and durable contribution that system made toward motivating children to learn fourth-grade arithmetic. Most children considered themselves to be taking control of the learning session and made the technology work for them. They needed the teacher's help to learn how to do this, and they needed curricular materials programmed in such a way that they could rely upon their own initiative, pacing, and interests:

> Sara smiled as she worked on PLATO. She did an ADDITION CHECK-UP (Whole numbers). She had no trouble following directions or working the problems. Sara typed slowly. She read the directions slowly and carefully as she worked. Her second lesson was RUBBER STAMP (Whole numbers). Again she advanced through the lesson with no trouble.
>
> Her third lesson was PARKING LOT (whole Numbers). Sara finished the "fives" easily. PLATO informed her that she was ready for the 'sixes.' Sara turned to the observer and said, "I don't know the sixes and I don't want to do them." The observer knew that most children her age were working on the sixes so she asked Sara if she didn't want to try them. Sara said she did not want to.
>
> Not listening, PLATO presented her next problem: "5x6". Sara worked it even though she had said she wasn't going to. Her answer was correct. She clapped her hands and seemed happy with herself.
>
> The authors of the lessons had structured them in such a way that most children continued to be successful,

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*Bernadine Evans Stake. "PLATO and Fourth Grade Mathematics," Journal of Children's Mathematical Behavior, in press.

but at the same time, challenged rather than bored. At the same time that Sara was saying that she wouldn't do the 6's, PLATO continued to present the lesson and hold her attention. Sara was helped past the threatening situation. PLATO managed to create a positive situation out of a potentially negative one. The authors worked long and hard to invent ways to hold children's attention and challenge their thinking. In most cases they stretched the use of the hardware to accommodate the learning situation.

Sara then chose SPEEDWAY (Whole Numbers) from the game slot. Sara looked over at Kathy's terminal and asked Kathy which race to do on SPEEDWAY. Kathy said, "Do GRAND PRIX." Sara chose GRAND PRIX. Kathy and she discussed the game. Sara entered herself as "RACER" and named her opponent, "SLOW POKE." RACER worked hard to win. She missed 4x1. She got it right on the second try. When PLATO took time-out to say, "Great, you got it right this time," Sara said, "OK, OK," indicating "Let's get on with the race--I don't need to be told I'm right."

Sara gained four years that year according to the achievement tests. At the beginning of the year Sara had had to sit by Ms. Hamilton to do math. By midyear she was on her own.

Ms. Hamilton used PLATO as a "behavior modifier." She said she had to. She pointed to Ted as an example.

At the beginning Ted had been terribly competitive. He gave up if he could not win. On PLATO he was different. Ms. Hamilton said that at the beginning of the school year when Ted was finished with PLATO he was finished with school, so he was required to finish other lessons before he could work on PLATO. Ms. Hamilton said:

> *Ted is doing much better. His work habits have improved a lot. At the beginning of the year, I couldn't get him to write a sentence. Today he chose writing as an activity. His coordination is poor, but he's very fast on PLATO. Ted has gained much more control and his writing has really improved. Ted is happy with himself now and I feel PLATO gets a lot of credit, maybe not all, but PLATO made a big difference.*

Ms. Hamilton was asked if she would prefer having a teacher aide or PLATO. She chose PLATO without hesitation.

I think more children profit from PLATO than from a teacher aide. I think they learn things that an aide cannot teach such as concentration, skim reading, which is very difficult to get kids to do. They learn to pace themselves, to be intently involved. The trouble with one-to-one with a teacher is the students become so dependent and I think they become independent with PLATO. I have to balance that to say there are times when a teacher has to help at the terminal.

INDIVIDUAL DIFFERENCES

The diversity of student performance, experience, motivation and all else was repeatedly apparent to us at the sites. The insights, beliefs and recommendations of the youngsters varied greatly--as everyone would expect. How these differences were affecting student learning was the subject of a previous section in Chapter 14 entitled "Diversity of Wants and Standards," particularly in the first subsection on "Heterogeneity."

The only differences we will take particular note of in this section are differences due to sex and differences due to race or ethnic background.

Sex Differences. That girls do not achieve as well as boys in science is a widely accepted belief that is supported by research evidence. At the secondary school level and above, the achievement test scores of girls are generally lower than those of boys.*

The National Assessment of Educational Progress (NAEP, 1975) reported that males generally perform better than females in mathematics and science. Although there are few differences at nine years of age, the differences are evident at thirteen and continue to increase through adulthood.

Females are underrepresented in science-related careers. The lesser achievement of girls in science has been the subject of several inquiries in recent years; most of the studies have focused on mathematics.

Many of the case studies that have been reported here included some mention of differential course-taking behaviors or preferences, as will be described later. However, sex differences received relatively little attention in all of the studies. This probably resulted from a combination of factors. Other issues were viewed as more important there and more in need of coverage here. Sex differences may be so ingrained that many school personnel and researchers are not aware of them. Perhaps the differences were actually relatively minor at some sites.

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*L. C. Comber and John P. Keeves, Science Education in Nineteen Countries, International Association for the Evaluation of Educational Achievement (New York: John Wiley & Sons, 1973); Elizabeth Fennema and Julia Sherman, "Sex-Related Differences in Mathematics Achievement, Spatial Visualization and Affective Factors," American Educational Research Journal 14 (Winter 1977): 51-71; L. E. Tyler, "Sex Differences," in Encyclopedia of Educational Research, 4th ed., ed. R. L. Ebel (Toronto: Macmillan, 1969) pp. 1217-1221.

Sells* referred to mathematics as a "critical filter" for the admission of women (and minorities) to higher education programs and, consequently, to careers. She cited data for the 1972 freshman class at Berkeley which showed that forty-three percent of the males and ninety-two percent of the females did not have the prerequisite courses for the standard freshman calculus sequence. The sequence is required in many undergraduate programs as well as upper division courses in such areas as business administration, and is "essential" for sufficiently high scores on tests required for admission to law school. People who do not have the calculus sequence tend to end up in the "traditionally female, lower-paying fields of criminology, education, journalism, librarianship, social welfare, and the humanities." Rowe** said that while remedial programs can often help students with inadequate backgrounds catch up, it appears to be more difficult to overcome mathematics deficiencies.

Fennema*** and Fennema and Sherman**** postulated that girls' mathematics achievement test schores are lower primarily because they have had less exposure to mathematics education than boys. They found that smaller proportions of girls than boys enroll in optional mathematics courses, a finding that has been confirmed elsewhere.***** When differential course-taking behaviors were controlled, test score differences tended to be reduced to non-significant levels.

With the possible exception of spatial visualization skills, cognitive variables do not seem to be related to sex differences in mathematics achievement. Although further research is needed, it appears that there may be sex-related differences in spatial visualization skills and that those skills may be related to mathematics achievement.

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*Lucy W. Sells, Mathematics as a Critical Filter for Minorities and Women: Problems and Solutions (Washington, D. C.: The American Sociological Association, 1976), pp 2-3.

**Mary Budd Rowe, "Why Don't Blacks Pick Science?" Science Teacher 44 (February 1977): 34-35.

***Elizabeth Fennema, "Influences of Selected Cognitive, Affective and Educational Variables on Sex-related Differences," mimeographed (Madison, Wisc.: University of Wisconsin-Madison, 1976).

****Fennema and Sherman, op. cit., 1977.

*****Lucy W. Sells, "Preparatory Education for Women and Minorities," in Developing Opportunities for Minorities in Graduate Education, (Proceedings of the Conference on Minority Graduate Education, University of California-Berkeley, May 11-12, 1973); Donna M. Kaminsky, Edsel L. Erickson, Martin Ross, and Leila Bradfield, "Why Females Don't Like Mathematics: The Effect of Parental Expectations" (Paper presented at the American Sociological Association Annual Meeting, New York, August 1976).

Social influences, primarily sex-role socialization, seem to be the basic factors underlying sex differences in science and mathematics achievement and course-taking. Several people who responded to the NAEP announcement attributed the differences to sex-role socialization. In a review of the literature, Fox identified several social influences on mathematics achievement.*

> *The perception of the usefulness of mathematics for future educational and career plans and the support or lack of support from significant others appear to be the major factors associated with women's decisions to elect or not elect advanced courses in mathematics. These factors are in turn influenced by the stereotype of mathematics as a male domain. Other factors associated with course-taking and achievement are attitudes towards mathematics, feelings of self-confidence, and values.*

Fox found that girls are less oriented toward careers than boys, particularly careers in mathematics and science, and tend to be unaware of the importance of mathematics and science to careers. Ernst** found that boys who do not care for mathematics study it anyway because they perceive its utility. In the RIVER ACRES case study, it was noted that boys tended to drop a level in mathematics more often than girls (p 1:66), perhaps this occurred because some boys found courses they had taken because of social pressures too difficult. Fox cited research which indicated that parents, peers, teachers, and counselors tend to reinforce stereotypical attitudes toward mathematics as a male domain, discouraging girls from taking advanced mathematics courses, failing to encourage them to do so, or accepting their poor performance in the courses.

Anxiety toward mathematics, or "mathophobia"*** may be related to low achievement in or avoidance of mathematics. An exemplary high school science teacher in BRT admitted that she was among what she perceived as the majority of people who are afraid of mathematics, and indicated that she had communicated this to her students (pp 4:8-9). She also said that students were "scared away" from physics and advanced chemistry courses. Social stereotypes might well intensify such anxieties among females.

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*Lynn H. Fox, "The Effects of Sex Role Socialization on Mathematics Participation and Achievement," mimeographed (National Institute of Education, Baltimore, Md.: The Johns Hopkins University, 1976).

**John Ernst, Mathematics and Sex (Santa Barbara: University of California, 1976).

***Lewis R. Aiken, Jr., "Update on Attitudes and Other Affective Variables in Learning Mathematics," Review of Educational Research 46 (Spring 1976):295.

Lou Smith, in the ALTE case study, found evidence that supported the above analyses. Although the same curricular choices were available to boys and girls, fewer girls take advanced science and math courses (p 3:48):

> A number of teachers take strong value positions here. One teacher commented about self images of female students.
>
> *The girls say "I'm not good at math" and find excuses not to continue studying it. But the boys say "I think I could get it--I just don't study hard enough." I have been working with the girls, and I might have gotten a few back on the right road this year.*
>
> If these comments are veridical, if one subscribes to the value position that equal numbers of girls should be moving toward professions involving science and math and if the youngsters' parents agree, then the attitudinal roots lie, in part, well before the curricular choices in the high school.

Rowe* said that "successful scientists tend to have a stronger sense of fate control than do less-successful scientists." People who have an internal source of fate control believe that they can significantly influence the direction of their own lives; people who are externally controlled think they are ruled by other, sometimes unknown or mysterious, people and forces. Groups, such as women and minorities, who have experienced powerlessness and discrimination tend to believe that they have relatively little control over their own fates.

Evidence from some of the case studies suggested that course-taking patterns may be changing. The number of high school girls enrolling in science courses was increasing in URBANVILLE (p 5:14). Students and teachers attributed this to changing attitudes among counselors, parents and peers. The perception of science as a male domain was decreasing, and people were becoming more aware of its utility for career opportunities. The proportion of girls taking upper-level high school mathematics courses was higher than expected in PINE CITY (p 6:36), and was increasing in RIVER ACRES (p 1:98). However, although junior high females in RIVER ACRES may have been under increasing pressure to take advanced courses, they did not necessarily like them or achieve as well in them as boys (p 1:66).

> The counselor said that for everyone that wants to go up a level (in mathematics), five want to go down. (Boys want to drop a level more frequently than do girls.) This is a peculiar trend in that across all subjects about two in three

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*Rowe, Op. Cit., 1977.

requests are to go up a level. There is another consequence of level switching in mathematics that is sex related: "Moving a girl down is usually big trouble from the parents." A counselor and a teacher and the department head made similar observations on other patterns of girl students in mathematics learning. The best students sometimes do not like mathematics. While boys who do well in mathematics can be counted on to like it, this is not the case for girls. Some of the highest performing girls have confided to the counselors that they really don't like mathematics. Such comments are not made for the benefit of the boys (who are not there) and are not related to whether they like the teacher(s).

Another teacher said, "I have the feeling after 23 years that my top boys understand mathematics better than do my top girls even though they [girls] will score better." (Can't give reason. Not sexist.) Whatever the case or reasons for such interest and/or competence, the lowest levels are populated more by boys than by girls, with a disproportionate number being Black and Mexican American.

Several methods of increasing the participation and achievement of girls in science and mathematics have been suggested. Career education and counseling services might be improved. Teachers might be made more aware of the subtle ways in which they influence behavior through their differential treatment of boys and girls. More mathematics and science courses might be required, forcing girls to take them. Teachers might be helped to overcome their own anxieties and weaknesses. Female mathematics and science teachers might serve as role models, helping reduce the "male domain" stereotypes. All-girl classes which would eliminate girls' anxieties about competing with boys and prevent the occurrence of typical sex-role behaviors in class (such as the RIVER ACRES (p 1:87) girls who read laboratory instructions while the boys did the work) have been suggested; however, Fennema says that this must be approached with extreme caution because its long-term effects might be negative.* Available information suggests that the current emphasis on upgrading women's roles in society is helping to redress the problem of differential achievement; however, it seems unlikely that those social influences will be sufficient by themselves to eliminate the differences in the near future.

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*Fennema, op. cit., 1976, p. 51.

Ethnic differences. The education of ethnic minority students (primarily black and Mexican-American) was a major concern at several sites.* Several schools had experienced increasing minority enrollments, and some of the case studies include descriptions of the perceived consequences. This excerpt is from the WESTERN CITY case study (p 7:23):

> As Anglos have been leaving the neighborhoods close to City High ("White Flight"?), Blacks and Chicanos have been moving in. This has had the general effect of decreasing scholarship and lowering of standards. Some teachers and administrators have also indicated that the situation will probably get worse before it gets any better. On the other hand, there is no evidence to indicate that this is really the case. The only evidence that is available is that there has been a steady increase in the number of ethnic minority members attending Western City High and an attendant decrease in science--chemistry and physics--enrollment. The local community college reports that while in 1967 the City High School matriculation rate to the college was 62%, the rate for 1974 was 47%. The community college also attributed the loss of enrollment from City High due to the end of the Vietnam War and other factors.

And from the RIVER ACRES case study (p 1:4):

> The general increase in enrollment has included an average annual increase of about 300 minority students for the past four years. Lower student achievement for minority students--principally Mexican-American (20%)--and Black (10%)--when compared with 70% Anglo students, has been noted over the years at all grade levels. The minority student achievement patterns are accompanied by high dropout rates and a "lack of motivation for traditional and remedial school programs."

And from our 100% black high school (p 9:11) in ARCHIPOLIS:

> A natural quasi-controlled observation opportunistically offered a demonstration of how a class of students influences the performance of teachers. The same social studies teacher taught both the "top rated" ninth grade class, and the ninth grade class that "seemed never to bring anything off right." The latter was a mixture; eight to ten streetwise kids; a few already accomplished entrepeneurs of the ghetto; a few serious students; and the majority, youngsters whose most common response to school "opportunity" was lethargy. Even lively, hard-working, articulate Ms. Matlan, with valiant efforts, could not seem to change their momentum. Pep talks. "All right. Class 9-28 is good, but you can be, too!"

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*The ethnic/racial composition of each of the CSSE school districts is shown in Table II (p C:14) in the Methods section of Booklet O. The representation of minority populations in most CSSE schools was greater than in the district as a whole (p C:15).

Lack of motivation was noted as a problem also in PINE CITY, where more than 60% of the students were black (p 6:15):

> *Motivation really is the big problem here. I don't understand why it is, but looking at it rationally, students in the northeastern part of the United States consistently score higher on tests of academic motivation than students in the South. Yet I am sure our students are just as able.*

There was some concern in RIVER ACRES that Black and Mexican-American children are rarely in top-level achievement groups. They were in groups 3 and 4 (p 1:87):

> *When you go to a lab with a 4 (group) you have got a problem. It is better to do teacher demonstration. It is often better because you get the right results and they almost never do. They are so busy breaking beakers they never get anything complete anyway. So at the very least the teacher can show them how it does work if you want to do it right. Their attention span is so short they will be wandering off doing something else if you don't watch them closely. They'll really destroy your lab if you're not careful. Over 60% (of) level 4 are boys. Black kids get assigned to level 4 mostly because of a reading problem, next because of a math problem; next because of a discipline problem; and last because of a science problem.*

A retired teacher in RIVER ACRES viewed the education of low-achievement students historically (pp 1:85-86):

> *Before 1974 they were all in special education, since then they have been phased into the regular program. They just can't read and the new words do "keep coming" in science. But it isn't only a matter of scientific terms. I once asked all the kids how many had ever been in a cave? Do you know what it smells like? Over 90% of my poor kids had never been underground at all. Never below ground level; think of it! Meanwhile a lot of my upper (social class) kids have rock collections, have visited mine shafts, have had more first-hand experiences than most of their teachers.*

There were comments in the RIVER ACRES case study about the lack of remedial programs (p 1:66):

> Last year Eastland had a remedial reading and mathematics program paid for by federal money. This year it is reading only. When the program was in effect bureaucratic red tape got in the way of instruction for some children. "We had to kick some special education kids out of Title I mathematics remediation (reading/arithmetic) because of the 'no-kids-in-two-federal-programs' rule."

And in WESTERN CITY (p 7:7):

> Of the three main ethnic groups in the W.C.S.D., the Chicanos are the ethnic group that exemplifies the loss of mathematics achievement. By the end of the sixth grade, the Chicano group is reading almost two years behind grade level and over one year behind grade level in mathematics. Whether this is due primarily to language difficulty is not known but there is some evidence that indicates part of the problem:
>
> > *. . . just arrived from Mexico. We have him sit over there because no one can understand him. He hasn't learned to speak English yet. When he gets to the point where he can understand English, we will start him on math and some of the other areas. . .*

There are some bilingual education programs, but surely not enough. In RIVER ACRES (p 1:4):

> There are a few bilingual teachers in a few of the elementary schools. Although I observed a first grade teacher (Anglo) conducting school in Spanish, the district does not have a bilingual education policy. The principal of an elementary school can decide to offer part of the school program in Spanish.

Observations of a high-achieving group of students in ARCHIPOLIS' inner-city school, however, provided a more optimistic portrait of minority education:

> . . . I saw this "peach of a class" in general science, several working on science fair projects, and another time in math class. But my most striking encounter with them was after the social studies observation in the science room when I suddenly realized that several of the students were speaking Spanish to one another. I began to talk to the four or five boys, two in particular, in Spanish, to find they only had been studying it for six months; had never been in a Spanish speaking country, nor neighborhood, and were being taught Spanish by the math teacher! In a school world in a very poor urban neighborhood, this intellectual "oasis" had taken shape. How teachers responded and worked with them one could get some idea of what enthusiasm and effort teachers were capable of had they not been beset with student conduct and heterogeneity problems.

Chapter 16

THE TEACHER IN THE CLASSROOM

Girl: Where are you going? -- to math?

Boy: No. I'm going to aftermath!
Man, have we got that teacher going in circles!

In numerous penetrating studies* the life of the classroom has been described and in other persuasive studies,** the necessity for teachers to be enthusiastic and full participants in any effective program of curriculum change has been documented. One thing support agencies such as the NSF still have not come to know, however, is how teachers decide things. We need, not just the characteristics of classrooms and general policy for innovators, but understanding of detailed processes or mechanisms which lead teachers in one case to adopt an idea or a set of materials enthusiastically and, in another, to reject such proposals as "unworkable in their situation."

What we learned from many of our direct interactions with teachers in this study was that they were not just taking a "sour grapes" attitude about curriculum improvement. They were not cool toward innovation just because they were not the ones invited early to participate in curriculum development programs or institutes. They had been telling anyone who would listen that they know what will work in their classrooms, and what will not, and that they know that most of the heralded innovations will only work in exceptional situations.

What it is that will work appeared to be largely an unarticulated knowledge, somewhat but not highly idiosyncratic to the teachers themselves. It involved basic goals and responsibilities teachers assume which most curriculum authorities and instructional technologists do not consider primary. It involved a style of

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*For example: Louis M. Smith and W. Geoffrey, The Complexities of an Urban Classroom: An Analysis Toward a General Theory of Teaching (New York: Holt, Rinehart and Winston, 1968); and Phillip W. Jackson, Life in Classrooms (New York: Holt, Rinehart and Winston, 1968).

**Especially: John I. Goodlad, Frances M. Klein and Associates, Looking Behind the Classroom Door, 2nd ed. (Worthington, Ohio: Charles A. Jones, 1974); John I. Goodlad, The Dynamics of Educational Change: Toward Responsive Schools (New York: McGraw-Hill Book Company, 1975); Ann Bussis, Ted Chittenden and Marianne Amarel, Beyond Surface Curriculum: An Interview Study of Teachers' Understandings (Boulder, Colorado: Westview, 1976).

teaching and set of beliefs about what good teaching is which are acquired early and contribute to the functioning of a social system that is--even in many of the most liberal communities--conservative and resistant to change. Teachers referred to their students as needing certain kinds of material, certain prior conditioning before they could meet expectations of others, and certain ways of being handled to get them to work. We noted that they did not always express these ideas clearly, but we also noted that they knew that educational specialists reject most of them out of hand.

In analyzing various kinds of information from our sites, we took those remarks seriously. We attempted to search out what it was that goes on between teachers and their students that convinced teachers of these widely held beliefs. This quest frequently involved taking a sympathetic approach to practices most scholars of the discipline and education specialists regard as serious distortions or misuses of the subject matter and to purposes they thought the subject matter should not be asked to serve. The attitudes many teachers had of reluctance and even hostility toward the best efforts of scholars to help them, began to make a certain sense when we tried--as participant observers particularly in one of our research sites--to adopt the teachers' positions ourselves.

This quest was one of the most difficult we undertook in connection with the general goal of describing what was happening in classrooms. We were not able to make much progress on it until the site visits of the spring of 1977, when most of the data-gathering by our field observers had already been completed, and it was not until the summer of 1977, after most of the individual case studies had been written, that site visit observations relevant to this problem were largely appreciated. When we then looked into the case studies themselves for <u>explicit</u> confirmation we usually did not find it. There were supportive statements but not as much confirmation as any of us would like. The field observers usually were working on the <u>curricular issues</u> deemed important at the sites, in the classroom, at the school building level, or, in one or two cases, at the district level--and were not usually attempting to probe deeply into the individual teacher's belief system. However, the field observers did make many observations of classroom practice which we can now interpret in terms of the perspectives that emerged from this quest.

We shall begin this assimilation and synthesis chapter with some of the most relevant of our site visitors' observations, then we shall turn to the CSSE National Survey, where some questions relevant to understanding teachers' belief systems appeared and finally we shall consider those portions of the case studies that can be understood in the light of what we have learned from the site visits. This chapter differs methodologically from the other assimilation chapters in the primary use it makes of site visit data.

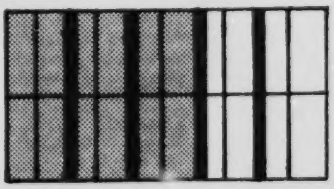
In reviewing these data, we deal with a variety of problems: teachers' maintenance of classroom control, teacher's acceptance of the "givens" of the situation (what other teachers will expect of their pupils in later grades, for example), how teachers feel about themselves as persons and as professionals, what they think of the various support systems (universities, supervisors, institutes, textbook publishers, teachers' unions). Throughout this chapter, we try to keep in focus both the particular details of subject matter and materials that are useful to teachers for their professional goals and the particular details of subject matter and materials that interfere with the responsibilities they have assumed. Above all, we try

to keep clearly in mind the image of teachers, largely working alone in personal struggles to select and adapt materials, to educate and control the allotments of young learners they receive from an increasingly skeptical student population. We hope that such progress as we have been able to make on this important task will stimulate others to study it more intensively in the future.

SOCIALIZATION AIMS OF TEACHERS

We begin with an excerpt from the report of site-visitor mathematician Hassler Whitney of the Institute for Advanced Study at Princeton:

> Basic math class, Mr. Blue: Work on adding fractions. (The junior high class seemed extremely like a fourth-fifth grade class I visited several times in Princeton). Ramondo was doing a problem just about as shown at right. When he reached the 1 ^{29}, he then wrote 29 below the 84 and added, "Is this right?" This is quite typical of what happens in any grade: trying to remember something somewhat like what you are supposed to do.
>
> $52\frac{2}{5}$ $\quad$ $\frac{12}{30}$
>
> $21\frac{5}{6}$ $\quad$ $\frac{25}{30}$
>
> $11\frac{7}{30}$ $\quad$ $\frac{7}{30}$
>
> $\frac{1}{2}$ $\quad$ $\frac{15}{30}$
>
> 84 $\quad$ $\frac{59}{30}$ / 29
>
> 29
>
> 113

> Loraine had written $\frac{3}{5} = \frac{12}{20}$, and asked me if that was right. I drew a rectangle, divided it into fifths, and asked if she could show me three fifths of the rectangle. She shaded this. I then asked if she could cut the rectangle into twentieths. With some trouble, she cut each piece in half, then in half again. Now she found that she could count the twentieths, and got twelve. She expressed new understanding. (Of course, I was using a remedial technique that is supposed to give understanding, and does something in this direction, but by itself is not lasting--it was too much <u>from me</u>, not from her; I wanted to see if she could get the sense of what meaningfulness could be. She is going into nursing school; understanding is much more important than algorithmic knowledge here.) (Emphasis added by CSSE staff.)
>
> 
>
> I talked to her a couple of minutes to see if she could get a sense of the need for and meaning of security, so she would not need to have assent to each thing.
>
> This is one of the greatest problems of present day "back to basics," as I see it. The attention goes so thoroughly onto doing the right thing, hence learning and remembering, that there is not at all sufficient time or energy to grasp what is happening <u>in your own terms</u>. Then with teacher or helper not around, students feel quite insecure or lost. In particular, they do even more poorly on basic skills tests, after they have been away from the work for a period, than in

the more traditional classes. This is certainly true very largely, though some are better than others at memorizing and following rules. Even these are most commonly unable to solve story problems, except more or less by rote, if in a familiar form.

Discussion with Mr. Blue: He has already spoken of basics as the greatest need. I spoke of my experience with Ramondo, and how understanding might help. His reaction was to get turned off; he had probably had too much of this kind of talk, and long experience in failing to see better results from "discovery." "Drill it into them" was his comment; he had learned that this was the only effective approach.

Hassler Whitney here recognized one of the key dilemmas for a teacher: whether to focus on the students' long range needs or their immediate needs. Mr. Blue knew that there are students who survive freshman algebra and geometry, who finally come to operate meaningfully on fractions. But his students were unlikely to get that far because they could not seem to grasp the meanings of operations on fractions. His two tactics seemed to be (1) trying to motivate students to try harder, and (2) trying to get elementary schools to set higher standards for arithmetic achievement. That is, Mr. Blue and teachers like him felt they have to deal with the immediate problem rather than taking a more basic long range approach. Whoever one might sympathize with most the absence of any relief is tragic.

Mr. Blue did not seem to consider that fractions in "basic math" might become at least a bit intersting in their own right. The traditional mathematics world, the university mathematics department where he studied even the technical world of the hospital, the pharmacy, the grocery store, where the English systems of measurement once demanded facility in operations on common factions, have almost entirely ceased to do so. What was also clear was that the models Mr. Blue had in his profession (e.g., the senior high school advanced math classes and university classes) did not encourage him to move in the direction Whitney saw as desirable for the educational development of students. Whitney and Blue both knew that spending more time with physical models of fractions alone would not do the job. Perhaps both would have agreed that making mathematics interesting would require a new atmosphere for both teacher and pupil, an atmosphere that would require each to relax his concern for getting that one next page of arithmetic done correctly. But standardized tests, and the tendency some students have of taking advantage of any relaxation to mock the school system, would not go away. So the tactic of making mathematics interesting did not appear promising to either in this situation.

Numerous remarks made by teachers to site visitors suggested that the demands of classroom teaching inhibit change in the classroom. A young teacher said:

What I think is very sad about first year teachers is they're so disappointed after they get into the classroom. [Vigorous laughter from other teachers present.] You have all these neat activities and good ideas but you cannot work in the classroom-type situations we have and have these things be successful . . . By the end of the first year, she's made a lot of revisions and things aren't nearly as fun as they were, and by the end of the second year she's thrown out a lot of them.

The teachers we talked to had an internalized concept of what the constraints in the classroom were and why new methods, ones that assume a different pedagogical framework or expository style, were likely to fail.

In terms of in-service training, including summer institutes, what many teachers wanted was not a major overhaul of their conceptualizations but a chance to talk with other teachers and collect some "gimmicks" that could be incorporated into their existing schemata:

> *The institutes that I've attended that have been really worthwhile are the ones that provide a new bag of tricks or an elaboration of a bag of tricks . . . Most of the people . . . want to see some things that can be applied in the classroom. Like this anthropology curriculum project--a fully and completely integrated program. They come in with the skulls and bones and artifacts and site maps and the film strips and records. After you've gone through that material a couple of times, you can elaborate on it yourself. I think these are the kinds of things teachers are looking for . . . No additional courses--I wouldn't be interested in that. But if someone were able to provide some techniques or some new strategies, I think that would be interesting.*

This teacher seemed to be relatively flexible. Another attitude was reflected in the following:

> *For the most part, the newer teachers haven't really had enough opportunity to reach a state of despair about institutes because they haven't had enough institutes.*

An extreme reaction was that of the teacher who rejected all outside advice as "interference":

> *So much of what I've gotten in in-service training that I've tried to use either I haven't been successful or it hasn't worked out that I'm kind of in the mood now that I want to be left alone and clarify things for myself.*

One of our concerns was to understand the different perceptions of science teaching by teachers and the subject-matter specialists who attempt to help them with curriculum and pedagogical problems. One hypothesis was that subject-matter knowledge, as an end in itself (a common assumption of the academic community), got transformed in the school into a means of meeting the socialization demands of the school.

It was clear to us that the school had a set of social norms (ways students were supposed to behave) which conflicted with the norms teachers were taught to espouse in teacher training courses. Not only the education courses had dysfunctional norms: the liberal arts norms were essentially the same. A high school English teacher said:

> *When I got out of the university, I was very keen on intellectual problems; and I was terribly frustrated*

> *that I couldn't get my students to respond. Then, just when I had almost decided to quit, I discovered that I really liked high school kids. Now, I have no trouble getting them to think, because I can relate to whatever they are talking about and put it in some intellectual form; for example, into philosopher Stephen Toulmin's forms of argument.**

Frances Stevens, writer, and professor emeritus from Leeds University, and frequent visitor to U.S. schools, made some very interesting observations. After visiting the social studies departments of a junior and a senior high school at one of our sites, she wrote:

> One consequence of pedagogical authoritarianism is a simplification of the teaching-task. As the principal of the junior high school rightly said, "Teacher-centered teaching is the easiest form for everybody."
>
> "You could find," he went on, "thirty individual programmes for thirty children--but it's a hell of a lot of work. When 'open education' is really well done, the degree of structure is very much higher. . . . Yes, in the classroom here the teacher is the authority."
>
> A disciplinary curriculum and authoritarian teaching are, as the principal said, easiest for everybody. Easiest, that is, in the situation in which they succeed. This remark, though it sounds either tautological or cynical, is not. I mean that, given a curriculum which looks sufficiently like that on which the parents were brought up . . . ; given students who approve of their own social milieu and traditions (approve, that is, in the sense of largely taking them for granted), and are therefore strongly motivated to acquiesce and to succeed on the school's terms; given teachers who believe in the firm outlines--outlines, not detail--of the traditional curriculum, and not as mouthpieces and its authority; given that the larger social environment is fairly stable; given all these things, authoritarian education is easiest. A large number of "givens" but all were present in the situation I observed.
>
> My last "given" may seem questionable. "We are the little boy with his finger in the dike," said the high school history teacher. . . .
>
> When the teacher's authority is associated with a disciplinary curriculum there are two reciprocal consequences. First, the teacher authorizes the curricular content (not the same as subject-matter) through his or her unquestioned commitment to the "structure" the students are to "identify." Secondly,

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*Stephen E. Toulmin, The Uses of Argument (Cambridge: Cambridge University Press, 1958).

> where this commitment is not wholehearted--even though to question it may be ultimately indicative of greater independence and inner strength--the teacher's personal authority is threatened, especially if the total situation is dominated by an articulate and powerful parent body. Both these consequences were clearly observable in the school visits.

Frances Stevens thus indicated that ideological disputes about pedagogical style were not as critical as the personal problem all teachers face: how to maintain student respect and willingness to work. Teachers often appeared to use subject matter to demonstrate their personal competence. They testified that something more than showmanship was required, namely, wisdom in handling tricky situations, e.g., where students challenged accepted mores by playing one peer against another.

How is this wisdom acquired? Who writes the book on it? It is rarely discussed in educational psychology courses, almost never in science methods courses. In the best college preparatory high schools some teachers become "wise" to the students slowly. In "inner-city" schools, a quicker response is required. Some teachers apparently come by such wisdom naturally, but most struggle to develop it on their own. Frances Stevens continued:

> It was observable that, outside the curricular situation teachers' authority and status vis-a-vis the pupils was variable, and that some of them seemed to be a little unsure of their social position. One teacher, magnetic in personality, could almost certainly "hold" his students in or out of the classroom, even though he might choose to do so on a very loose rein. Another, dogmatic though his professions were, evidently doubted his capacity to keep his students in class on the verge of a holiday. A third, efficient and dominating in class, had, I think, revealed some uncertainty in her personal relationships by setting a class to make a composite portrait of her through a checklist of qualities. . . . (Has a good sense of humor; knows subject and sticks to subject in class; has a good reason for giving punishment; has irritating personal habits, etc.) Yet another reported, revealingly, that she had said to her students, "I'm not your servant;" this last teacher was also visibly anxious to ascertain from the observer some hints of the students' reactions (in interview) to her programme.

When teachers criticized pre-service and in-service programs--as they frequently did--many appeared to have in mind a personal struggle with the act of teaching. To whom could teachers turn for help on such problems? If these problems were even a small part of the problems teachers had to work out alone in their classrooms, then it is small wonder they were not very articulate--as they were not--about what they wanted from their training and did not get.

Three Reference Poles. We saw the science teacher working conceptually as if influenced by three poles: (1) the ethic of scientific inquiry, (2) the "ideal" science teacher role, and (3) socialization responsibilities. Two of these are

apparent in the following report on an advanced placement biology class prepared by co-director Jack Easley:

> The classroom was dark for the showing of a short, silent film of the growth of plant shoots filmed by time-lapse photography. The teacher explained that the problem was "phototropism." The cells of the animated sequence were drawn in, so that students had a schematic representation of the different rates of growth on two sides of the oat shoot. What was unclear from the animated diagrams was whether there were more cells on the rapid growth side or whether these cells were simply getting larger. That is, the question several students seemed to be getting at was whether the hormone that stimulated growth, or inhibited it, affected the rate of cell division or the size of the cells or both. The teacher was evidently not prepared for the question, having been focusing on the technique by which the hormone was abstracted and applied to the shoots. I observed that the students did not press the question when they found the teacher's response unhelpful. I am reminded of so many similar situations and of the tremendous number of things the teacher has on his mind when in such a situation. There is the projector, which wasn't working perfectly, the darkness, which prevented his seeing the students, the visitors (two of us), and the points he was going to make in future classes, labs, or tests about this experiment. You have to push the class on to the points you want them to get, so you can only give the illusion of scientific thinking, and a scientific attitude may get lost.

Here we see the conflict between scientific inquiry as an intellectual discipline, the pole of reference of most science education and curriculum specialists, and the teacher's obligation to direct student work: to emphasize what they should be expected to remember, what they would need in subsequent courses. The teacher had to attend to what they would need for the advanced placement tests used in deciding whether, once in college, they would get four hours credit for this course or not.*

Any school is a social system. Teaching an advanced placement course was near the peak of professional status in that social system--not something to be risked by engaging overlong in an interesting intellectual dialogue. It might reveal a spot of ignorance. It might jeopardize one's standard.

Most teachers had not had training that would make them respond "instinctively" to the fruitful observation or the penetrating question of a thoughtful student. They were trained in the same undergraduate courses that prepare students in universities for graduate studies. These were seldom research seminars of the sort reserved for doctoral students--to explore areas of doubt or ignorance. How could we expect them to conduct lessons in a comfortable inquiry approach? Teachers know when the student strays beyond the path along which they themselves have traveled, and depending on personal risk-taking tendencies, may either pull him or her back onto the path or encourage the exploration further.

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*Advanced placement courses were strongly supported by many of the more academically ambitious parents and students of the school.

It is important that we look at other models of science teaching which teachers aspire to, for there we can see "distortions" of learning and "distortions" of subject matter in the hands of teachers primarily pursuing socialization goals. We perhaps can learn more of what the more authoritarian (in an academic sense) teacher aspires to from Frances Stevens' observations:

> It must be made clear that what is seen as the essential core facts and disciplines is not to be identified with a parroting of information. The teacher interviewed in the junior high school insisted that he was concerned not with facts, but with the relationship between facts. In the high school, the history teacher said: "The outset of the high school career, the facts themselves are not nearly as important as the qualification and finding of facts. The subject-matter for our freshmen and sophomores is not the pedantic knowledge that the Magna Carta was signed in 1215, but the knowledge of how you would go about deciding that this is an important document. Is it primary or secondary? You look at the mindset of an author, the time at which a document is written, and so on. By the end of the high school programme, the student should have learned a disciplined approach to historical material. From knowing how he moves towards knowing.
>
> Students taught--and, in these two schools, for the most part very efficiently--within a conventional and conservative framework are following two curricula. The first is the body of established knowledge and procedures to which the learning-encounter is intended to be instrumental. The second is the personality, which of course includes individual preferences and value-systems, of the teacher, communicated in the learning encounter. Students of the teacher just mentioned must have learned, besides the facts and processes contained in the syllabus, his passionate concern for the careful discriminations and unremitting logic of historical method, as well as his commitment to an austere discipline that shuns delights and lives laborious days.

This seemed to be at the heart of the teacher's struggle, a struggle with which they get little outside help.* It reflected and grew out of struggles with their own studies or at least that part of their studies in which they could take personal pride. It involved an intimacy, a sharing of pride and value-commitment, with their students, within the context of instruction in math, science, or social studies.

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*Worse still, the few minutes they could devote to this struggle were increasingly conscripted for the formalization of instruction, such as objectives-writing and testing.

Frances Stevens continued:

> The very givenness of the ostensible curriculum can release the power, sometimes hardly perceived, sometimes very consciously felt on both sides of the learning-encounter. "I search out materials that reflect my own value-system. . . . I think they know how I feel about these things. . . . I guess that's the most important thing. . . ." The reciprocal of these words from a teacher is (from one of his students): "He teaches the way the kids like--he puts himself in their position--he knows our feelings."

Certainly not every student shared in the mutual (teacher-student) tuning of values and feelings illustrated in this quotation. But the power she referred to identified another pole of reference--the socialization pole, for the relationships involved in socializing youth are more often felt than explicitly known.

After observing a junior high school teacher-team discuss difficult cases, Frances Stevens reported:

> There was a discussion on whether a girl, weak in English, could be regarded as "having completed the year successfully." Her English teacher rather grimly reported a succession of low passes and failures in her recent grades. Though this teacher did not assert herself verbally, her reticence implied that she would be very reluctant to let any student get away with unsatisfactory work too easily. A student was said to have shown distinct improvement in his work of late, especially in science, but "he is not being dangerously encouraged," added the science teacher with a slight smile. A discussion of kindly sternness took place about a student who, all agreed, had not made the grade during the year. Though his work was below standard, his attitude and behaviour had been quite satisfactory, and all were anxious that he should not be humiliated at the graduation ceremony. . . . The longest discussion concerned . . . a student . . . who had been suspected of stealing on more than one occasion and had been obscurely threatened with punishment, and had subsequently been detected in manifest "thievery" and at a time when other students were aware of it. . . .
>
> Conducted in civilized tones, discussion of this whole situation was nevertheless full of emotion; and, though the personalities of the participants (teachers, principal and vice-principal) differed considerably, there was a great deal of shared aggression, first signalled by the use of the word "thievery" (in preference to "theft" or "stealing"). The discussion rested on two bases: an abstract principle of retributive justice (thievery must be punished), and practical considerations of social order. (On the second, the principal produced a persuasive argument: in his experience, he said, suspension had seldom or never improved the "behaviour"--the word is revealing--of the student, but had almost always produced an improvement in the behaviour and attitudes of ninety-five per cent of the student community.)

This discussion, like others occuring in most schools, may seem far removed from the classroom interaction relating to the subject matter of science, mathematics and social studies. However, it was just this sort of concern--to reward sincere effort, to avoid over-rewarding students for modest accomplishment--that directed the course of instruction in the science classroom, as in all the classrooms.

We became alert to the fact that most teachers felt they had to use the instructional time and materials in order to socialize students into the social order, and that this was often where problems with proposed reforms in content or method arose. But in this case, as the observer noted, there was a problem with the way school work was regarded.

> In the rather complicated argument which gathered about this last case, there were two discernible threads: First, that suspension would not be a sufficient punishment for the boy if he were allowed to make up his school work (as his mother had requested); and second, that, as he was an idler, missing school would be for him a sort of holiday, and thus a reward rather than a penalty. . . . Eventually it was agreed that he should come to school during the two days of holiday on which, of course, the other students would be absent.

The enthusiasm teachers had for positive responses from "weak students" was such an important part of their concern for socializing students that another example (besides the case of the student whose English was poor) is worth considering. Frances Stevens quoted a history teacher as follows:

> "They're so much geared to giving answers," said the teacher (alluding to the answer-question approach in the class I had observed), "that I thought I'd give it to them the other way round." How much they were indeed "geared to giving answers," was shown in another part of the same lesson. In answer to the question, "What were two of America's big problems in the post-World War II years?", one boy said, "The world didn't have enough love." This response provoked a gale of laughter from the class and slightly nonplussed the teacher who commented mildly that this was connected with a lot of problems. When I later referred to this interchange, the teacher's face lit up. "Oh, that was one of those beautiful moments," he said. "It's like music--you just know when it's right. He's not very bright and did you notice how David [a bright student] put him down? But I think they know how I feel about these things--I guess that's the most important thing." Was it? I deliberately recalled the incident again, when interviewing one of the students. The boy laughed. "Oh, that!" he said. "He just said that because he didn't know the answer. He didn't take it from where he was supposed to. He made that up."

Clearly, students were making a rigid system of the standard way the school rewards them. How impotent is this teacher's desire to support certain values against

the social pressure to learn what was in the book and how to give it back. The music of a creative response ringing in the teacher's ears did little to charm the students.

Frances Stevens went on to another telling point about teachers in general, (not that particular teacher):

> I have already observed that the work in American history depended, appropriately, on considerable reading-assignments. With caution, however--since there was not time to go into the matter at all thoroughly--I suggest that, unless the teacher was both exceptionally well read and also subtle in guidance, this meant an excessive reliance on the textbook.
>
> Such reliance certainly made for security and precision. But textbooks are written by people, and are often digests of other books written by other people. The book in the hands of the student may be many removes from the historical event or situation; and the distance is not necessarily lessened by much inclusion of "course materials." In a sense, the better the textbook, the worse: I was able to have only a cursory glance at the book on which an eighth-grade class was being questioned; but I noticed that, in its survey of post-war Europe, several Iron Curtain countries were mentioned as being "occupied" by the Russians, and that a series of quick-fire answers to this effect was accepted by the teacher. In what sense occupied, and for how long?

Most teachers questioned about their philosophy of history or historiography had little to say. Their concern was structured by the circumstance of their own classroom. Many seemed content to see to it that students knew the textbook and perhaps could discuss current events in the light of the assigned readings. Criticism of the textbook was an interesting topic to only a few teachers and to an even smaller percentage of students. The scientific inquiry pole of teacher reference is evidently not strong enough to overcome the pull of the other two, the schools ideal for teaching and the great demand for socialization.

A Vignette on Socialization. The moral importance some teachers attached to having children persistently trying their best (illustrated by a teacher avoiding "dangerously encouraging" a boy doing poor work) was also illustrated in a junior high school pre-algebra class. The game GUESS MY RULE was being played. Jack Easley's vignette also succinctly illustrates the conflict in the purpose of the game from the point of view of experts in mathematics education and against the socialization responsibilities taken for granted by the teacher.

> Whoever has the chalk calls on a volunteer to make the appropriate next move: (1) making up a secret rule and giving a pair of numbers such that the rule takes you from the first to the second; (2) guessing a second number when given a first; (3) guessing a first number when given a second; (4) formulating the rule for testing against the table of number pairs accepted by the rule-maker. Figure 16-1 illustrates three of the rules and the tables of the nearly dozen rules that were created and guessed during the class. As the game progressed, the rules became more complex, which means that the probability of becoming stuck tends to increase for each player as the game goes on. (See Martin Gardner, "Mathematical Games" Scientific American, 237 (October 1977): 18-25, for a discussion of this point.)
>
> This game was quite unlike most arithmetic exercises from textbooks or from work sheets. There the probability of getting stuck decreased as one worked more exercises. In several ways the game did not fit well in the socializing function of school mathematics--trying your best to do what you are told to do. This came out clearly in the following three instances:

Δ	Π
2	7
3	10
4	13
0	1
10	31

$\Pi = 3 \times \Delta + 1$

Δ	Π
49	8
1	2
3	
17	
16	5
25	6
36	7
81	10
144	13
400	21

$n = \Pi - 1$

$\Delta = n \times n$

$\Pi = 1 + \sqrt{\Delta}$

Δ	Π
7	55
2	5
3	11
0	-1
10	109

$\Pi = \Delta^2 - 1 + \Delta$

$\Pi = \Delta \times (\Delta + 1) - 1$

Figure 16-1. Three completed tables and equations from the game GUESS MY RULE.

The teacher had been observing that several students, whom she later identified as unmotivated and as lacking self-direction, were simply not playing. They were just sitting the game out, so she broke into the game and called on one of them. When the student went to the board and put a number in a column and it was called wrong, she said, "Well, try again." However, at this point the game had changed subtly, and numbers were being guessed for the left-hand column with no numbers in the right column. In the center table of Figure 1, we see the "3" he wrote and can understand what had happened to the game. The left-hand column now had to be filled only with perfect squares, at least the boy who had made the rule was not allowing any others. The boy, called summarily to the board, said, "But I don't understand what is wrong with "3". I don't know what to do." He had a double reason for being stuck. He didn't know the rule, or at least didn't know that it involved taking a square root, which hadn't been studied, and he couldn't imagine why now suddenly putting an arbitrary number in the left column was not allowed.

The teacher, however, persisted forcing what developed into a beligerant stand-off, saying, "You can't just quit. You have to keep trying."

After finally giving up on this apparently stubborn student and returning to the game, which she seemed to have forgotten, the teacher got stuck. She put the 17 in the left column, evidently getting the adding (or subtracting) 1 ahead of the square rooting. The students who, by now, had guessed the rule were quick to help her out, although none had dared to help the boy who was stuck. (Later she explained to the observer that she thought it was a good lesson for students to know that even teachers can made mistakes.)

This was not her only opportunity to exhibit being stuck. Having essentially taken charge of the game now and, perhaps needing to get back to the mathematical aspects, she volunteered for the function number (3) formulating the rule. Her efforts to write a rule on the board were all quickly proved wrong by the students using the examples of number pairs. Finally this observer offered a hint--that she try two equations with a linking variable. This got her "unstuck" and she wrote the two equations shown above the line at the bottom of Figure 1.

After another rule was made up by a student and eventually guessed, (right hand table, Figure 1) the bell rang and the teacher hurriedly assigned the task of thinking up more rules so the class could play the game again tomorrow. As the pupils were leaving, however, two boys approached this observer and showed him single formula rules they had written for the previous case. Both used the radical sign, which the class hadn't experienced, and one was in fact correct. (Below the teachers' pair of rules in Figure 1) For some reason, perhaps because the radical hadn't been introduced

> officially in class, they had been unwilling to offer their rules to help the teacher when she was stuck on the rule formulation. Of course, another factor was lack of confidence in handling radicals. Or perhaps they had their hands up, but simply didn't get called on by the teacher.

There is much in this vignette that makes it clear why this particular game is not compatible with the teacher's sense of responsibility. However, Jack Easley's conversation with her during her free period later the same day revealed even more:

> She remarked right away, apparently aware that the stuck pupil at the board was a scene that needed explaining, that there were several students who had not developed enough personal resolve to tackle their work when the going got rough. "I don't know what's going to happen to them," she said, "but I can't give up trying to get them trying harder." "What if they don't understand?" I asked. She replied, "I can't accept that as an answer. They have to learn to keep trying."
>
> I asked her how often it happened that she and the students cooperated in solving problems helping each other as equals, the way they did when she had put the 17 in the left column. "Now, about 10%" she said, "but in the beginning of the year, not at all. They first have to learn some math." Then she talked about how much she wanted them to realize that it was all right to be wrong, if only you didn't give up. Students confirmed this. Talking with six or seven of the students later, they told me that she did often make mistakes on purpose to see if they were paying attention. Some, however, did not appreciate teachers who made errors, on purpose or not, but others came to her defense, saying that she did not make nearly as many as another teacher they knew.

Perhaps mathematics educators who invent challenging games like this one could develop an entirely different kind of game that would employ more of the values the teacher wanted to emphasize.* Consider, for example, what she said about the ways the students treated each other:

> She spoke, also, about changes that were developing in the students of the class. Some of them had begun to mistreat each other in ways she found shocking, dropping jello-filled balloons on each other in stair wells, socially ostracizing certain children who were broken up and lost as to any possible reason. She had seen evidence of this cliquishness during the math game, in that active participation, raising hands, really trying, etc. was not related

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*Of course those people who invent games and curricula are bent on socializing students too, but in different directions than most teachers are.

> to ability but to social group. She felt she had to fight this with everything she could, and would apparently have welcomed a game or other activity that would have broken down cliques. It reminded me of the attitude of my parents, at my first teen-age party, who wanted to have us play mixer games.

Could it be that we were getting close to the principal mechanism that causes teachers either to reject an innovation or to modify it for their purposes in ways that its developer would not appreciate? Why similarly, was so little use made of hands-on materials after the first two grades, even though they are there in a corridor or closet nearby, or even displayed on a shelf in the classroom? Why, for example, were hand-held calculators almost universally banned from elementary and even junior high school classes, when studies* have shown real possibilities for improvement of arithmetical thinking through their use? Why, for example, had the terminology of the new math, introduced to clarify mathematical concepts, simply been added to those things that have to be memorized, or skipped entirely when encountered in the textbooks?

Hard Work is Good Work. Educationists are sometimes startled to confront teacher views paralleling the remark attributed to Minnie Woodson, a member of the school board of Washington, DC:** "The children don't understand that learning is not easy, that it takes application, they don't know how to apply themselves." This is also reminiscent of the teacher Frances Stevens quoted who said that a boy was "not being dangerously encouraged." Teachers said they could not change the fact that life is going to require youngsters to do a lot of things that do not make sense at the time, and that seem very difficult. Therefore, they argued there should be a significant body of learning at every grade level which is difficult, which may not make much sense at the time, but which has to be learned by every student.

It is interesting, in this connection, to consider how teachers and curriculum specialists might interpret David J. Armor's statement of educational goals (given as a basis for analyzing school and family effects on black and white achievement). He wrote:***

> *There are several quite explicit goals of this (common) educational process. (1) Foremost is the learning of some basic cognitive skills--reading, writing, and simple*

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*J. F. Weaver, Calculator-Influenced Explorations in School Mathematics: Number Sentences and Sensational Transformations I, II, Madison: Wisconsin Research Development Center for Cognitive Learning (ERIC Microfiche no. ED 123088, 1976); Marilyn Suydam, Electronic Calculators: The Implications for Pre-College Education (ERIC Microfiche no. ED 127205, 1976).

**In Newsweek, 12 September 1977, p.64.

***David J. Armor, "School and Family Effects on Black and White Achievement: A Reexamination of the USOE Data," in On Equal Educational Opportunity, ed. Frederick Mosteller and Daniel P. Moynihan (New York: Vintage Books, 1972), p. 171.

> *arithmetic--which are crucial for a person's full participation in modern industrial society. (2) Second, the secondary school provides instruction in various subjects--sciences, business, languages, etc.--which helps students to decide upon and prepare for further training in a specific occupation. (3) Third, the school at least implicitly attempts to impart attitudes to the student which help him to become an adjusted, participating citizen. These might include personal self-esteem, respect for law and the rights of others, and an understanding of the commitment to the national culture. (4) Finally, although not necessarily part of the educattional process per se, schools provide some opportunity for aiding the physical and psychological welfare of children through the existence of health clinics, physical education, free-lunch programs, and counseling services. (indices added)*

While many curriculum specialists would stress the general educational value of course work (goal 2) more than its vocational value, teachers and schools appeared to us to have downgraded general education. The third goal (Armor called it implicit) appeared to us to be the dominant goal of teachers, permeating instruction that is ostensibly oriented to goals (1) and (2). Curriculum specialists may complain that the goals of arousing students' interest in the study of their physical environment and the world of ideas has been omitted, but teachers seemed to reserve that for an elite group--those who have demonstrated achievement of the other four goals.

That lists of student goals poorly represent teacher goals was shown again by Helen Simons, site visitor from the University of London, Institute of Education. Summarizing a fifth-grade lesson she had observed* Helen wrote:

> What I find interesting about this teacher's style is her mixture of openness or acceptance of where the children are at, intellectually, and certainly about what she wants them to know. She left them to work out their own strategies first; listened to these; made sure that other children understood the method each group had used by interjecting questions like, "How did you get that?"; "Wait a minute. I don't understand"; "I don't know what that means." Then she evoked alternatives. If the children did not raise them (mostly they did) she would guide them to alternative ways of resolving the problem which she would then explain as she did with sampling which John had not used. She is always in control and stays with the question until she is satisfied that they have understood it. Her tone was consistent throughout. If children said nothing, that seemed to be O.K. If they appeared to be on the "wrong track" she would always say "O.K., All right, "

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*The whole vignette on inquiry, featuring an Elementary Science Study unit called "Peas and Particles," was presented starting on page 12:11 of this report.

> and try a different strategy to push them towards another method or the one she wanted them to learn. If someone gave the wrong answer in the same tone she would simply say, "no" and look for the right answer from someone else. There was no hint of criticism in her voice. Occasionally she did check up on those who appeared not to be paying attention by saying, "What did she say? I did not quite hear"; or, "Are you guys paying attention over there?" But I sensed this was more an attempt to get them to focus on the task and learn than to censure their inattention.
>
> What is obvious to an outsider is her commitment to the brightest. In discussion, the articulate and confident are heard first. There was John, who was asked to offer his explanation. When he had finished, she responded to one of the brightest girls . . . and was in the process of listening to an explanation of that girl's second problem (despite an objection from one of the other groups that not to hear them first was unfair) when the bell rang. She did not pay much attention to those who did not have the immediate reply. One senses that she gets a lot of intellectual excitement and reward from hearing the brightest talk through their discoveries or guiding them to understandings she thinks important.

Besides staying in control, we notice that working mainly with bright students raised a teacher's social status. The principal confirmed our site visitors' impression of the teachers' high prestige.

Still another interesting point came out when Helen Simons asked this teacher if she saw a difference between social science and social studies. She replied:*

> *I don't think I differentiate here. I think they overlap. I think . . . I guess social science would be concerned with teaching values . . . some important concepts about man and his environment whereas social studies is technically geography--rivers and their tributaries . . . and possible geographical concepts like that I think I would classify that as social studies. But social science you really have to learn about living in a community and having values. That to me is a science.*

Where would she place history? Her reply was:

> *I would say history is a social science too. You know why? Because if you are smart and you realize that mistakes other civilizations have made and you really try to avoid*

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*Reported earlier as part of the social studies section of Chapter 13.

> *making the same mistakes that is a science . . . our values come in there. . . . I think they [children] get values as you talk about these things [mistakes of other civilizations, differences in generations, etc.], but you have to talk to these children . . . I have a big chance to talk to them when they are out playing, I watch their reactions with one another. I think that's social science too--getting along with one another. And anything the guidance counsellor does with them is social science too.*
>
> And the lesson just observed? She hesitated and then suggested that when you come into a new area and have to decide what apartment to live in you estimate and decide on the basis of this or that observation of number of families, trees, children, etc. [Peas and Particles is about estimating numbers of things in large collections.] . . . what you prefer . . .
>
> *So I think there is a lot of social science there . . . being able to estimate and apply this and transfer this learning to something like that . . .*

This teacher, in linking science and human values, may have been closer to the ideology of the early curriculum project innovators, Zacharias, Friedman, etc. than to the positivistic, value-free research ideology taught in most university and high school science classes. Most secondary school science teachers we talked to probably would not support this teacher's view. Nor would elementary school teachers who prefer more "prepackaged" types of science programs. This observation seemed to provide a positive instance of a good fit between the personal, ethical, and preparatory aims of the teacher and the curriculum materials. Many scholars will feel that she has gone too far, however, in linking science and values--and is in danger of misrepresenting the scientific establishment view.*

One of the original aims of the CSSE study was to seek to understand the strong tendency for teachers to use worksheets, workbooks, or other "packages" of programmed exercises. Those that could be easily filled in, once an example was given, and which would be checked mechanically like an objective test, were found to have many adherents. Individually Prescribed Instruction (IPI math) was a typical example of this kind of program. We had a good opportunity to observe it in ALTE in two elementary schools. IPI mathematics was not the total program, and teachers were allowed to introduce whatever additional materials they wished. In the three elementary school mathematics classes and two study centers (where CSSE coordinator Jack Easley worked as participant observer for from one to three periods each) the same pedagogy was used whether the printed IPI sheets or a textbook were the source of the exercises. In his vignette (see the more complete version pp 15:9 to 15:12), Easley reported on different styles or math pedagogy:

> Fred leads the Wildwood project for the sixth grade, at Hilltop Sommerset School (where he teaches math to all sixth graders.) As he talked about planning for the week-

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*But the teacher would get support from Jacob Bronowski, Science and Human Values (New York: Messner, 1956): and André Cournand, "The Code of the Scientist and Its Relationship to Ethics," Science, 18 November 1977, pp. 699-705.

> long outing that was coming up, he mentioned that many students could get the right answer to questions about how many of this or that camping supply they would need, but couldn't do it systematically by arithmetic. "Those who were best in classroom arithmetic," he said, "often couldn't figure out practical quantities for a real project.
>
> Mr. Murphy, the principal, . . . described a "mini-class" he was teaching which involved setting up and manufacturing plant hangers made of string and wood. He said he was going to let the kids do everything, including buying the supplies, and he hoped they would have to borrow money and pay interest on it. He said that when they came across a practical arithmetic problem, he just let them struggle with it, and although it might take them two days, they eventually got it figured out to their satisfaction and his. . . .
>
> He admitted that, the way teachers worked in the classroom on math . . . the kids would forget the next week what they had been shown how to do and practiced this week. Such teaching had no utility, he felt. However, he had nothing but contempt for the junior and senior high teachers who demanded more math and reading skills than they were finding in their students. He grabbed his test scores to show me that his sixth graders were already doing far better than any junior high school math teacher had a right to expect.
>
> . . .
>
> When I asked [the principal at Mass Junior High School] if he could formulate the need for math teaching in such a way that all concerned would accept it, he pointed out that secondary and elementary school teachers see the world differently. Elementary teachers like to help each student do the best he can, secondary teachers like to cover the subject matter. I didn't ask about parents' views, but believe that teachers are mostly "locked-in" to parents' views of what should go on in school. Helping children think for themselves and understand math and science has a lower priority.

Although many different forms of school and classroom organizations were in evidence in the different classrooms we studied, one underlying system of operations was usually discernable. This basic system contained elements such as teacher-made assignments,* pupil focusing on teacher expectations,** teacher

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*Gary Knamiller "Perceptual Frameworks for Viewing Children's Expressive Activity in a Science Learning Environment" (Ph.D. diss., University of Illinois, 1971).

**John Holt, How Children Fail (New York: Pitman Pub. Corp., 1964).

control of classroom activities, pupil demands that teacher give assignments and enforce doing them,* and teacher demands that pupils do their assignments.**

Preparing for Future Courses. In previous chapters it has been shown to no-one's surprise that many aspects of instruction would vary from one classroom to the next. For example, (1) instructional materials that provided the main organizing structure (a textbook, a set of work sheets, a cassette tape player, an electronic device to drill on arithmetic facts, a set of laboratory experiments, etc.); (2) whether the class moved along together or with pacing different for different groups of individuals; (3) whether or not homework was given in addition to school work, (4) whether any effort was made to relate the materials studied to pupils' out-of-school lives, to provide other organizing ideas, or to treat the subject "atomistically," (5) whether emphasis was primarily on memorizing facts, names, principles, and rules, or on acquiring skills (calculations, procedures, use of equipment, etc.), (6) whether evaluation of pupil learning was frequent or seldom, (7) whether the pace was such as to emphasize mastery or coverage, (8) whether pupils were allowed to help each other or required to work alone on their assignments, (9) whether students were encouraged to carry out projects as supplemental work or not, and (10) whether teachers were happy with the learning results or not. What was constant was that instructional materials provided the conceptual structure for the instruction rather than the teachers' or students' organization of thought about the subject matter. The principal reason for this now seems to us to be that the teacher's socialization goals--especially preparing pupils for success in later schooling--required that pupils learn to learn from materials.

We were persuaded that the majority of the teachers in our sites and even possibly in America would subscribe to the following beliefs:

A. Extrinsic motivation of students in some form is essential if students are to pay attention to their school work. Teachers should do what they can to motivate students, but many factors in the personal make-up and home situation of some students make motivation in academic subjects impossible.

B. Attention to directions, to the formulation of question, and to any presentations by teachers, textbooks, films, or other means is essential for academic learning. Teachers must help students keep attending to their tasks.

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*James Herndon, The Way It Spozed To Be (New York: Simon and Schuster, 1968).

**Louis M. Smith and William Geoffrey, The Complexities of an Urban Classroom: An Analysis Toward a General Theory of Teaching (New York: Holt, Rinehart, and Winston, 1968).

C. Students will learn most reliably when they are successful in carrying out assignments properly. Good study habits, note taking, and homework, are important. If homework cannot be done outside of class for various reasons, then teachers should provide time for it in school. Teachers should demand that work be handed in regularly.

D. Frequent testing of one kind or another (15:15) is important to make certain that the students have learned what they are supposed to. If they do poorly on tests, they should be encouraged to work harder on their preparation.

We noted how this basic structure of teaching beliefs and practices was influenced by the hot and cold winds of public attitudes, the management constraints of administrations, the social pressures among teachers, and differing expectations among students as to what teachers are supposed to do. So an innovation or reorganization at any one time may have featured self-pacing, grouping, and many other instructional variations. Teaching practices varied according to ideological and social attitudes, within and across communities and schools; and on the surface they bent like a reed, accommodating to winds that blew one way and another. Underneath, they were typically rooted in the four ideas above: motivating students, giving directions, promoting work, and getting feedback.

Jack Easley had this to say about his own experience as a univeristy teacher:

> When I'm working in the Sciences Tutoring Laboratory, I'm just teaching techniques and vocabulary and not the broad view of science I want to share. I'm "hammering it in" because I can see that those things are going to be necessary for my students to succeed in the courses they are taking. So, as I relate to each student as an individual, I think of what he personally needs right now. When I sit back in my arm chair and become a "philosopher" of science, I wish that all students could have the experience of philosophizing about science and mathematics. But neither they nor I are going to push that when there's an exam in two weeks on three chapters of chemistry.

Preparing students for the next year is an important socialization function in schools. Obviously there needs to be some agreement on what goes on in which grade, or at least what comes after what. In most of our schools long division was scheduled to come after two-digit multiplication, and teachers many places refused to let pupils start it until they had first mastered two-digit multiplication. (Although only one-digit multiplication is involved in long division, that's not the point.) It was generally believed that there should be social and professional agreement on what precedes what. Some kind of standards should be set. It had more to do with solidarity than with epistemology. Some "milestones"--which the school faculty would agree on--seemed to be necessary if teachers were to shepherd their students through the subject matter without suffering the complaints (or even scorn) of their colleagues. That the milestones be based on a valid rationale or experience was not necessary. A pluralism of pathways or different milestones for different youngsters became troublesome--even though nothing was more traditional and perhaps more basic than differential treatment of individual learners. The concern for uniformity and the difficulties with heterogeneity were dealt with back in Chapter 14.

Science educators and others who have tried to help teachers find a compromise between the standardized curriculum and the needs of individual children have not been of great help. CSSE staff member Charlie Weller wrote, in summary of his visit to elementary schools at one site,

> Most elementary teachers don't like science because of bad experiences in their own schooling--elementary through college. Most in-service workshops are ineffective because they transport teachers out of their environment into a different environment where there are plenty of materials, show them how to use the materials, and then send them back home to recreate what they learned without any support. The message from the teachers is: Forget it! Unless workshop instructors come to the teacher's own classroom, work with her children, use her materials, and show that children respond positively, there is little chance of success.

In response to his visit to another site, Charlie Weller wrote:

> The teachers, not of their own choosing, have been placed in the middle of all these issues and are unable to resolve them. They feel they work very hard and that little if any of their effort is appreciated by administration, parents, or students. They feel they are expected to educate kids (prepare them for college, for life, etc.) but the kids don't seem to care. They feel frustrated, they feel that colleges of education have <u>not helped them at all</u>. (Italics in original)

The hypothesis that made these data most intelligible to us was that teachers (partly of their own volition) are fixed into the social system that places demands to be met in order to avoid extreme social discomfort--demands which are incompatible with the demands of the scholarship system. They belong to both systems but they are much less at the mercy of the scholarship system. Scientists and other intelligentsia have little effect; parents and other teachers have much. What teachers do with subject matter (according to this hypothesis) is determined by how it sustains and protects them in the social system.

If schools and teachers were effectively isolated from societal expectations (as opposed to scholarship expectations) perhaps pedagogical and curricular reforms could be sustained.* Jack Easley had these responses to this observation:

> I feel the same social function of the curriculum in tutoring. It doesn't matter if I know a better way of organizing a given course or set of courses. I can't change the chemistry department and I have to help my client with his present course. That's challenge enough.

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*Teachers showed us no inclination to be so isolated--and what we took to be their intuition makes political sense. The schools divorced from the social control would probably contribute little to social understanding of youngsters.

> Although I have drawn up an interesting bibliography on tutoring in the sciences, I find the problems I confront daily as a tutor (unreliable attendance, not knowing what students don't understand, focusing on small points and missing the overall theory, etc.) are not treated in the literature. So I'm saying the same thing the teachers are --viz, educational research and theory has little practical value when you're working with students having difficulties. I have more hope than most teachers, because I can think back to earlier experiences of a similar sort and realize that, in those cases, eventually I was able to work out a useful connection with theory.

> Another point teachers make, at which I used to scoff, I've been able to discover in my own teaching at the university. I've heard many teachers and school administrators say that the discovery approaches to teaching only work with the better students. I didn't believe them in principle because I know of a counter example or two. However, now I have my own experience with the much greater difficulty of making self-directed inquiry work with average than with exceptionally bright students. A graduate course I've taught for ten years and which lends support in its content to discovery methods couldn't be taught successfully by discovery methods until last spring when my class took over and taught the course themselves, for the most part. It was very clear to me that I had an unusually superior class last year, and that made all the difference.

Putting it in a nutshell, most teachers seemed to treat subject matter knowledge as evidence of, and subject materials as a means to, the socialization of the individual in school. On the other hand, most subject matter specialists treated socialization as a necessary evil, to be gotten out of the way early--for it is only a means to the greater end of subject matter knowledge. Socialized discipline was the lingua franca or "medium of exchange," within the school, transcending subject matter barriers. There was also a socialization within each discipline but only for the talented, college-bound students.

Each teacher had a somewhat different set of purposes, but a most common and vigorously defended purpose was that of socialization. It was intimately related to observance of the mores of the community, submitting personal inclinations to the needs of the community, conforming to the role of "good student," and getting ready for the next rung on the educational ladder. Of course there were great differences among teachers as to how they stress and interpret socialization.

It would be most incorrect to sort teachers into two groups, one which teaches good courses in science and one which indoctrinates youngsters in the social customs and values of the community. In the schools we observed weak and strong teachers alike devoted much energy and concern to socialization.

Both authoritarian and humanistic teachers did so. Of course they worked at it to different degrees, they stressed different values, and used different tactics to effect their aims. Only the disillusioned and the completely intimidated failed to participate in the indoctrination process. Almost no one who cared about education thought that teachers should emphasize social values less, though they had very different ideas about which values should be honored.

It appeared to us that teachers had been carefully selected to fit the community and that teachers were anxious not to put children or parents in anguish--so some occasionally went as "far out" as the community, the parents and the youngsters would let them, but seldom further. Of course there was not full agreement on the "boundaries," but we looked for and did not find confrontation. Observable differences among teachers were much more likely to be in areas about which the public was not apprehensive. Perhaps if all teachers were to take the same stand on some issue as the most radical or outspoken teacher there would have been trouble, but the community seemed comfortable with its mix of relatively stern socializers and relatively liberal socializers.

The more stern socializers promoted subordination, discipline, a "protestant work ethic," cheerfulness, competitiveness, and heavy investment in getting students "prepared." The more liberal socializers, no less concerned about having an impact on the learning and personality of the youngster, promoted skepticism, imagination, individual expression, cheerfulness and cooperation. Of course, most teachers appeared to be trying to do some of both.

An important socialization lesson with most teachers was "merit deserves special privilege." There is little belief at the present time that there could be anything wrong with academic discrimination. In RIVER ACRES, URBANVILLE and elsewhere, denial of learning opportunity is seen as warranted by poor performance. In ALTE, WESTERN CITY and elsewhere, "social promotion" is under attack. Although in this century the high school diploma has not been a certificate of competence, there is strong advocacy for making it one. The denial of privilege that would accompany the denial of a diploma is not at the present time considered a large social cost.

Such socialization in the classroom was pre-emptive in that it seemed to get immediate attention almost whenever an opportunity arose. Other learnings were interrupted or set aside, not always by choice, to take care of: an effort to cheat, an impending daydream, or a willingness to accept a grossly mistaken answer. One OHIO observer commented that socialization takes precedence over general study skills, general study skills over the specific operations (arithmetic, the chemistry lab), and the specific operations over subject matter. One teacher, or perhaps a thousand, said with a sigh, "I don't know what they're going to do when they get to seventh grade."

We found the essence of the dilemma in Mary Lee Smith's final paragraph (p 2:23):

> Teachers must juggle the expectations of the invisible, distant, and mostly impersonal profession of science education and the local, powerful, and relentless demands of teaching. The two roles do not necessarily conflict; but the latter usually overpowers and preempts the former.

Although based on relatively few, but sustained and careful observations, the picture of the teacher in the classroom that we have sketched in this section should be of value to those attempting to support and improve teaching. We can say little about how general are the concerns we have portrayed here. We have received indications from over half of the dozen or more teachers who have read this or heard it presented orally that they recognized and acknowledged an aspect of their professional experience that had not been considered previously. To us, the importance of this picture is that it provides a plausible explanation of why so many teachers reacted negatively to curriculum and pedagogical innovations that once seemed so promising. We were able to ask a number of questions in our national survey that bear on this matter of socialization and we turn now to a consideration of the response we received.

IN A SOCIAL SYSTEM

In the preceeding pages we have said things that might persuade the reader that we have little respect for the teacher. We think our respect for the teacher is considerable. In speaking of the teacher as one who tenaciously pursues his or her convictions, we are describing what we have seen, not speaking in praise or disrespect. As we behold the various and sometimes unrealistic expectations of the public we speak in sympathy and not in hope of helping out.

We have been trying to discover and describe the way science teachers see their jobs. We have been concerned about the inability of the education community to mobilize its forces to provide better education. Many who speak passionately about educational reform of all kinds have been quick to find the teacher and school administrator obstructionists. We found that a poor description. Their efforts contributed little to the aims of any reformist group because they did not agree with the new goals, just as they do not agree among themselves about many goals. They have not primarily been obstructionist. They have primarily been busily engaged in the conduct of education in ways consistent with their own personal values and with values they believe to be widely held in their communities.

The following letter* from a teacher to a local newspaper summed up, we believe, the plight, the optimism, the self-righteousness, and the sense of social service of a great many teachers.

> *Dear Editor,*
>
> *At last, I have had it with articles on what is wrong with education.*
>
> *First of all, after many years as an elementary teacher, I do not feel qualified to make sweeping generalizations about "education in America." It's a little like the blind man and the elephant--it depends on where you take hold. I doubt that any one person is qualified to make the sweeping statements I read in your Sunday edition.*
>
> *I had the best training possible for teaching, with more advanced work than many of us get. I had the advantage of good supervisors, administrators, school board and school systems. As with many of us, I listened to all the "facts," innovators, etc. and then*

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*"Mailbag," The Courier, Champaign-Urbana, Ill., September 1977.

went my own way in trying to teach the best I could. I think this is what most teachers do, so please, no more general statements about "how schools teach."

It is true that there is always someone with a new idea about how it ought to be done. Do you criticize medical people when they get ideas for improvements?

I doubt that the so called tests showing lower achievement are all that well-documented or accurate. The tests were made years ago in many cases, and the ones I've seen lately haven't been updated enough to test what is taught. For example, we have books on modern math but the tests we give are over traditional math, so I teach both. Besides, tests are only part of the picture, and "facts" can be twisted to mislead or to prove almost anything.

I've been around quite a few years--and I've yet to meet this well educated adult population of the past that the articles always compare us to. As Will Rogers said, "schools aren't what they used to be and probably never were."

As Americans, we are too prone to want to throw away the careful work of years, by a few cutting words. Government is a favorite thing to complain about. Education usually gets complaints when times are better and is neglected when they are poorer. I'm not about to sit by any longer while someone cuts swatches through my life-work with a few pat phrases!

Perhaps people get the education for their children that they deserve for them--just as we get the kind of government we deserve. Education certainly reflects society. Above all, the schools are what the people make them.

Sometimes, I do think that courts and high officials are trying to destroy education. They certainly put enough stumbling blocks in the path. The officials and legislators here in Illinois are very quick to take a hand in making rules for and demands on schools. These have to be complied with, whether they are educationally sound or not.

I don't think anything is that wrong with education. For an ungainly moster, it is in pretty good shape. There are lots of earnest teachers, caring parents, and concerned officials.

If there is any "difference" in educational achievement --and I really doubt it--I think it must be laid to the society leading the monster. Remember, the schools are pulled as many different ways as there are differences of opinion in the group being served!

If I see any real difference between now and then, it is in the motivation of students. Those immigrants had to learn assuming that they really did. Many youngsters today can probably get by in their culture without putting out much effort--for the time being, at least.

--And don't tell me it's as easy to teach a large group as a small one. I've been at it too long not to know the difference.

--And don't tell me it's as easy to teach a child who rides the bus a half hour each way, who can't go home for lunch, who has babysitters and little time at home with the family, and who has a family too busy trying to make a living in this inflated world to really give him all the time he needs.

Our country does try to educate every child--and most of them seem to want to go to college now.

I'm sorry to say that when I find a child who doesn't learn well, if it isn't from lack of trying, it seems to be from lack of what we call ability. Try telling that to a parent!

If you think education isn't doing a tremendous job, imagine the country without it!

Working Within the System. The great majority of teachers we were in contact with were personally committed to the task of helping young people accommodate to the educational system as it is, for their own benefit, and for the teacher's benefit--for the recognition that comes from being a cooperative member of the faculty and of society. Few could see how learning could occur without order and discipline. As indicated in the previous section few saw anything wrong with using the subject matter itself to create order and discipline. Student inquiry and independence of thought were often seen as things one wishes for, but which teachers should not allow to happen without pupils knuckling down to the dull, intricate lessons, first earning the right to express an opinion. Mr. Rogers, a high school biology and physiology teacher in PINE CITY (p 6:33) was noted by the students as a teacher "who makes you work hard," and described by a parent as a disciplinarian. He used spelling tests to stress technical terms and oral quizzes to focus on subject matter.

Teachers guarded against what they saw as the dangers of easy learning, chiefly the danger of exposure to teachers and university professors demanding memorization before understanding. Teachers were society-oriented more than subject-matter or student oriented. They did not want their students to be rebellious. Independence of thought--if acceptable at all--was the student's own business; it was not the school's business. In BRT we heard this lament (p 4:43):

You know I kind of get the feeling that this tone of anti-establishment is still with us, though maybe not so much as a few years ago. Students just aren't too

> *sure that we oldsters have much to contibute to them, that we don't understand them . . . Another thing is I think they're less competitive scholastically than they were even three or four years ago. Students don't seem to mind if they're not on the honor roll. And I don't know how much parents mind either. There's the idea, "Why should I go to college, spend all that money and time, and maybe not find a job?" Gee whiz, there's a lot of teachers out here without jobs. A year or so ago there were all those engineers laid off. They're selling hamburgers or something. Students say they can go out and lay bricks for eight or nine dollars an hour, so why should I go to school.*

This social studies teacher felt that a teacher's chief responsibility was to prepare the child to take another step into full acculturation but explained some of the social problems of the rural community (p 4:42):

> *Our students have to think in terms of a world a little larger than this community, so far as problems are concerned. We had this film the other day in sociology, Black and White Uptight. A good film on the race issue. The class didn't want to discuss it. I could see them shrinking, "Oh no, not that again." . . . I can understand the opinions they've gotten at home. They're simply repeating things they've heard.*

One teacher in RIVER ACRES commented (p 1:53):

> *You have to survive in the community in which you teach. They are paying you your salary with their money, so basically they have the right, to a degree, to keep certain things out of the school that they strongly agree should not be there.*

We took him to be speaking for a broader range of issues than the touchy subjects he has just discussed.

As in the following vignette on teacher overload, some teachers saw the system as rapidly restructuring the business of teaching.

> Carmen is one of the few Puerto Rican students taking the "college-bound" classes. She has at least a ninety average and is in her junior year. Her high school is in a low socio-economic neighborhood. She considers herself lucky to be mostly in classes with high-achieving, working-class, white and oriental kids.
>
> Most of Carmen's Puerto Rican peers are "always cutting out and getting into trouble." Carmen wants to go to college and to be a teacher. She feels that the failure on the part of many students is the fault of both the school and the students.

They are bored learning the same stuff over and over again and feel stupid never remembering it. Also, the school doesn't care if the students cut out--less trouble, especially with the budget cuts and everything.

Carmen is on her way to the junior high to meet and check up on her brother Reynaldo. He gets out of school twenty minutes later than Carmen does. Their parents have expressed concern that Reynaldo does not take schoolwork home and they want Carmen to see what is happening. Reynaldo is dismissed and meets Carmen.

At the same time leaving his class is Mr. Goldhammer, Carmen's former science teacher at the junior high. He approaches and greets Carmen with a big smile. "What's one of my best students doing around here?"

I'm here to check up on my brother Reynaldo. My parents never see him do homework. How is school this year?

Things are awful! So many teachers are out of license or being recertified in areas they have never taught. In fact, half of the math teachers in this school are really social studies teachers and art teachers who got laid off with four, five, and six years of experience. Everyone is really down. Even I am. I have to work much harder to teach so many more kids. There are forty or forty-five students in a class. Recertified teachers are just not experienced enough in their subject areas to do a good job under these circumstances. How do you feel about that, Reynaldo? Am I correct in what I am saying? How does it look to you?

Reynaldo says shyly:

You see, Carmen. It's not my fault. My teachers skip around a lot. It doesn't make sense to me. Mrs. Weinstein can't control our math class. She gives us a test every ten minutes or so when the class is not listening. I do okay by my test because I had the work last year, but most of the kids don't know how to do the work and don't take the test. Hell! Not only am I not getting homework but I'm not learning. She can't teach anyway, especially because she can't control the class.

Mr. Goldhammer says:

Things may be better in high school. At least high schools are controlled by the central board. No local community school board, probably less juggling of teachers. How is it at your school, Carmen.

Carmen responds by saying that the teacher of her chemistry class is really an industrial arts teacher but other than that all her teachers are in license. And

The largest classes are those with the smartest students and those students are working harder than ever before. They are trying to get as much education as they can from the overcrowded conditions. There are more oversized classes for the smart students because teachers who want the good classes are willing to accept more students in their class. The enriched intermediate algebra class that I am in has fifty students while the regular intermediate algebra class has only thirty-eight. It sounds crazy but sometimes I think that the budget cuts make students care more about school and care more about learning.

A colleague of Mr. Goldhammer's, Mr. Clancy comes out of the school. Mr. Clancy and Mr. Goldhammer are in the same car pool. Mr. Goldhammer says:

Well, Carmen, it has been a pleasure to see you. I'm glad to hear you are still doing great. I hope to see you again. I'll try to speak to Reynaldo's teachers.

Mr. Goldhammer and Mr. Clancy start off toward the car, stepping around a bunch of boys gambling outside a tenement house.

Mr. Clancy says:

You know, I'm starting to think that the back to the basics movement is just a way of rationalizing the budget cuts. Still I hear that at the high school the remedial classes, general math and math lab, are surprisingly calm. It might be due to the required minimum competency tests. This might by why the high school teachers seem to like the back to the basics movement.

Did you hear that the union might lose its dues checkoff privilege because of the Taylor Law violation last year? The union is going to be in big trouble trying to get membership to send in their dues on their own. Hell, the union sold us out anyway.

Come on, George, don't take everything so seriously. It's not worth it. Let's beat the traffic.

Headed home with Carmen, Reynaldo says, "I told you it's not my fault."

Well, I don't think you want to be a drop-out like so many of the kids. Do you like not getting homework, Reynaldo?

If I got homework I would do it.

It's too bad our mama and papa don't ever visit your school. They should complain about your teachers. I'll teach you math when I have the time so you won't go on to high school and only attend two days a week like so many kids who just have folders to work in. They don't ever carry books, pens, or pencils. They just get stoned all the time or gamble or both.

As Carmen and Reynaldo go into their apartment building in the projects, a group of teenagers are drinking wine. They call Carmen "jaitona" (snotty) and other names. Carmen hurries into the house and begins to prepare dinner for the family.

In contexts such as this questions of optimum pedagogy and choice of subject matter are over-ridden by making do, minimizing the losses, struggling to survive. The social system and educational system both seem the enemy, preventing the teacher from conducting even the minimum affairs of coursework. Still the teacher mobilized a daily effort to bring youngsters along to a maturity, to a socialization, that that teacher admires.

Anthropologists tell us that teachers in all societies pass on the values of the society. This we found in all our sites. Schools were the creatures of the social system more than of the Academy. Curriculum questions many places were lower order questions. But respect for science was still a part of the system. Regarding public opinion of science we heard in FALL RIVER (p 2:9):

> *Now the public is questioning the value of science, for some good reasons. Sometimes it has appeared that science has been misused. People are upset with the high costs of science, particularly the space program. What they don't realize is that this enjoyable society has been brought about by basic research . . . I spend a lot of time in class explaining the benefit of doing basic science.*

Another FALL RIVER teacher questioned the value of an extensive science education for all students. Despite this though, he still adhered to the belief in the importance of science knowledge:

> *. . . this is important for all ability ranges of students, a sense of being at home in the universe must be transmitted. The physical world and the technology of man must be dealt with as an important part of the total culture he is to inherit.*

Working Alone. We found the teacher working alone. During most of the day the classroom was filled with youngsters. Many helped the teacher, often the talk was person-to-person. Sometimes an aide was there, or a parent, or a cadet teacher. Other teachers influenced what the teacher did, but the teacher worked very much alone. Even those few teachers who were "team teaching" were trading-off rather than sharing teaching responsibility. The teacher was little dependent on any other adult, and the dependence of other professional educators on her or him was more rhetorical than apparent. It would be unrealistic to say that the teachers we saw were subordinate to a head of a department or administrator or part of an instructional team. They worked alone.

The job was as intellectual as the teacher wanted to make it. There were always opportunities to explore a new connection, to probe a strange way of thinking a child had got into. There was an abundance of literature on education, on science, on social science, on mathematics in almost all the schools. Some teachers were into it all the time, others were not--just like other people. Teachers told us they read quite a bit of this literature (see page 18:24), seeing it more as the pursuit of their intellectual curiosity rather than the effort to attain a higher professional competence.

We asked around about an archetypical "Mr. Science." We found one in an outlying suburban community in Southern California. We thought of him as the ideal the schools promote, as what every science teacher should strive to be.

A "Mr. Science" Vignette.

Sometimes when we think about a "Mr. Science type" of teacher we think of someone like T.V.'s Mr. Rogers, or Galloping Gourmet, or Jacob Bronowsky, one who commands attention by his personality and seeming flawlessness in handling the subject matter. Mr. Armison wasn't that; at least the klieg lights in his classroom were on what the students were doing, not on what he was doing. About 25 juniors and seniors in his anatomy class, Mr. Armison behind them, all facing a chalkboard, scribbled with the language of the muscles.

T: Let's start with deep peroneal nerves. (Another team of 4 students, 4 husky boys, go to the front tables, facing class.)

T: Okay the problem is deep peroneal nerves. The deep peroneal nerve has been cut; there's function on one leg. What loss of muscular function is expected? Can this person come into your class or office? How would you expect the deformity or problem to be exhibited?

S#1: OK. He would lose 100% of his doreal flexion and about 80-90% of his (inversion), so as he came in there he wouldn't be able to raise his toe. When he walked he'd come and he'd walk like this. (demonstrates down aisle) He wouldn't be able to raise his toe, so he'd just drag it along. It might also go out a little bit.

T: What remaining muscles innervated by other nerves can be trained to do some of the lost function?

S#2: (using notes) Well first of all the muscles that are going to be lost when you lose the deep peroneal nerve are the tibialus anterior, the extensor digitorum longus, the peroneus tertius, the extensor hallucis longus, and extensor dogitorum brevis. To make up for those muscles which were lost the tibialis posterior would take over and the flexor hallucis longus and the flexor digitorum longus and they would be generated by the posterior tibial . . .

T: Take over in what respect?

S#2: They would bring back the dorsal flexion and the loss of inversion. They would compensate for what is gone but they would bring back, y'know, only 10-15% of it.

T: of the dorsal flexion?

S#2: of the inversion

T: Oh, ok.

How about dorsal flexion? Any of those that could be trained?

S#2: No.

T: Good. Three: Describe therapy exercises in anatomical and in layman terms to strengthen the remaining muscles.

S#3: Ok. There's so much lost that there's nothing you can do for dorsal flexion. As for inversion------

The rest of the class paid attention, laughing at primitive efforts to draw a foot, some hoping that their turn would be put off a day.

How could any bunch of with-it California youngsters be turned on by muscles of the human foot? According to Armison, what the students do in science depends mostly on what you expect them to do. He allowed that this was not an unusual class though the course is an elective, most of the kids are pretty bright, and most are thinking a lot about nurses training, football injuries, artistic drawing, or something that relates such antiseptic systems to themselves.

Armison expects them to produce: to recognize a bone from any angle, to answer naming questions without a seconds delay, to write research reports from personally gathered data and with reference to professional journals and other reports of recent scientific studies. He does not expect them to be perfect. He expects hard work, verbal quickness, and reflection. He has a reputation—most students know what they're getting into. And afterwards, at least, they too pass the word that it was a good course. His key: never consider that less from them would be acceptable.

Little homework is assigned. Still they carry their cat home to work on dissections. Each one spends some time with human dissection as well. Armison stands as a table of expectations, a resource, a traffic light. The students do the learning and much of the teaching. Aids from last year's class demonstrate, take charge of the whole class in special moments. They arrange the specimens for make-up tests, and administer them. Nobody challenges their authority. Nobody questions their crossing of boundaries between teaching and learning. Students are expected to help each other.

It might be expected that some teachers would resent the flouting of convention, or at least that their work load might pale in comparison to his. It wasn't apparent. A teacher sometimes remarks "It looks like something is happening in Anatomy class because the students are all talking 'bones'." Perhaps there is a resentment that the high expectations and standards of one teacher robs study time from other classes. For a different reason, Math teachers earn such resentment. It did not seem to be a problem at Point Loma.

Of course not all Armison classes are volcanic. A recent class in marine biology seemed to have all the motivation of the jelly fish they collected on field trips. In class at least they drifted with the current, occasionally testing his authority. The formula didn't always work.

Armison worked pretty independently. No one else taught these same classes, though a couple of teachers kept track of his assignments in case they would have to, or get to, teach such a course some time.

Getting his space fixed up was a problem. He originally was given $600 to start the course. He browsed in shops selling used medical supplies, bought a bunch of junk. By a great stroke of luck, an opportunity came along to have all the lab equipment replaced or repaired—and his junk turned into a working anatomy lab. He needed journals, so he advertised in a Shoppers Guide, and got donations "by the wagonload" from retired professional people.

He took pride in being a scavenger, derided the idea of packaged science courses. Armison felt that the experience in a science course has to touch the immediate concerns of teacher and student at least once every day, that the assignments have to be guided so that there is personal meaning to the study of the basic knowledge of the course. He has found few education courses useful, has never attended a workshop. He wants science teachers to have their own professional societies, to meet occasionally and to talk about new developments in the field.

Selecting new teachers is perhaps the key decision a school makes—and he felt that present teachers should play a major role. His Superintendent was taking action that increased the number of first year teachers. Armison thought that was a mistake, that it was too risky to take persons with no experience when experienced persons were in large supply.

Armison had little hope for any assistance from the district, state, or federal level. The California program for Mentally-Gifted-Minors got him funds to purchase some much appreciated skulls and models, but he felt the program itself raised the wrong expectations in the minds of too many students, parents and teachers. If any students are to get special attention from society because they are likely to contribute so much in return, he felt it should be to the high achievers—a different group than the MGM group.

He was not greatly distressed by the Stull Act or at efforts at Agencies to specify the objectives for a course. Somehow the teachers he knew remained suitably insulated from the political turmoil. The course objectives were obvious and needed little attention, once you had first "put them together" at least in physiology and anatomy courses. He found no contradiction with the need for teachers to change their courses each year (to keep up with the times) and to stick to a set of objectives (always oriented to student ability to know the parts of the body and their complex interdependencies).

Asked what NSF could do to help improve science education, Armison mentioned two types of support: regional symposia for teachers, and grants to individual teachers for the development of curricula for their classrooms. The symposia might be offered separately to teachers in different specialty areas, e.g., chemistry, biology, physiology. Teachers are most likely to be able to attend if given released time for doing so. The symposia should feature recent developments in the field; education classes had been of relatively little value to Armison. He strongly favored the individual grant approach to curriculum development to the dissemination of materials developed either by researchers or by teachers.

> *I don't like, nor do I very often use, materials prepared in total units by somebody someplace else. Every course is what one teacher has to make it. It has his personality, his stamp on it. No one else could teach this (anatomy) course. . . . Science rooms are filled with some other teacher's dreams of what a class should be. It just stockpiles back in a corner someplace.*

Mr. Armison was a fine teacher, a challenging teacher, though not really specializing in "inquiry teaching". He was similar to the teachers Frances Stevens told of earlier in the chapter, stimulating, personable, bright--but thoroughly determining what the youngsters were to learn, teaching them the official parts and authorized parts and purviews, not drawing from them the personal creation of ideas. Should he have been more? No one suggested that to the observer. Not many teachers or parents told us anywhere that the child should be given every help to be an independent thinker.

We observed little inquiry teaching in the eleven sites. Most of that was in elementary and junior high schools. We asked junior high school principals and elementary teachers in our National Survey samples to respond to the following questions: (The responses are given below each question; "†" indicates differences of special interest.)

Please estimate the percentage of instruction time the average teacher in your school spends in "inquiry teaching," that is, lessons in which students design and carry out their own investigation.

	47 of 86		78 of 150		
	7-9 Principals		K-6 Teachers		
	N	%	N	%	
†	16	18%	34	40%	Less than 10%
†	19	55%	12	14%	10% - 25%
	7	10%	10	11%	25% - 50%
	2	1%	5	12%	More than 50%
	3	16%	17	23%	I don't know

We estimated the median here to be about 10% time spent in inquiry teaching, still a bit higher than our field observers reported.

Why isn't more time spent in "inquiry teaching" (as defined above)? (Where more than one response was given, one was randomly chosen and included below. See also p. 18:68).

46	7-9 Principals	76	K-6 Teachers	
	N		N	
	5	†	9	It is too hard to ask students enough of the right questions
	4		12	Students are too likely to "goof off."
	11		22	The necessary equipment and supplies are too difficult to provide.
	11		22	Most students cannot really carry out inquiries effectively.
	0	†	0	Inquiry gives pupils the false impression about what learning is.
	15		11	Other

We noted that the emphasis we have given to socialization in this chapter was not supported by the zero response to the last alternative above. Here and elsewhere teachers sometimes denied that they were promoting a certain set of habits and attitudes, more of a cultural than intellectual kind. We expected that at least a few of the teachers would have objected to inquiry teaching (as some of our interviewees did) because it gave the impression that science is not a serious, highly purposive activity.

Case study observers found few natural inquirers among teaching staffs. PINE CITY's Miss Green (pp 6:18 to 6:24) was such a teacher. (Read particularly Rob Walker's discussion of Miss Green's personal sensitivity.) Rob quoted her as follows (p 6:24):

> *I'm striving to motivate my students to find something that they will be interested in. When I see them full of questions--really interested--then I find ways or sources from some place. To me the most stimulating experience is feedback from the students.*

At BRT, Mrs. N. (pp 4:7 through 4:18) was a teacher highly interested in scientific matters as well as students and community. She preferred, she said, "Labs where you don't tell the kids what the answer is," and continued (p 4:10):

> *I let them think about it and ask them questions and then respond to their questions. I think that's better because that's what the lab is supposed to do--give them an idea of how general concepts were first determined. If they already know what the outcome is going to be, they don't see the significance of doing the lab. In the classroom this kind of teaching is harder to do. I'm not good at it. I have difficulty asking the right kinds of questions. I can ask questions if I have something physical to look at. Just like today in physics class--I had trouble asking the right questions to get those kids to see what I wanted them to see in that problem about the car on the ramp, that the weight would act straight down.*

Her self-analysis was confirmed by the transcripts of portions of several of her classroom discussions (pp 4:11 through 4:18) and in the description by site visitor Charles Weller of one of her biology labs. He wrote:

> The students were working in groups of 2 or 3, busily involved in the activities, in what looked like a very good laboratory. The teacher was walking around and talking with the groups in a relaxed manner. The students were getting things done and enjoying it.

In ARCHIPOLIS, an elementary school teacher said (p 9:4):

> *Actually, I really enjoy science. But I haven't had the time, with all the other things to teach, to put time into developing a science activity. Actually, the children enjoy it. We sent the children to the environmental lab, and they came back bubbling. EPA puts it on. But with the press of other things I just couldn't take up on that.*

We found another example of a teacher who thought that laboratory work should be interesting, not just finding out what's obvious, in the BOSTON case study.

As reported in "Conversations in the Teachers' Lounge," Steve was listening to David's argument that method had to be taught before dramatic experiments can be worked on. David summed it up:

> *And for most of them, writing a scientific report is not something they are used to doing, in fact some of them have got so used to multiple choice tests that it is an effort for them to write complete sentences.*

Then Steve replied (p 11:6):

> *Maybe you are right. I think teaching them rigor and method is a useful thing to do. The danger though is that you end up just pacifying them. The science that is going to affect their lives isn't the five stages of writing a lab report. It is nuclear power, pollution, recombinant DNA research. Those are the things I want them to know about, and I want them to be able to pursue things for themselves, not just because they are in a course or a textbook.*

Here was the exception of two teachers working closely together. And both of them pointed to one of the teachers' major dilemmas. If they wanted the work done according to standards set in university level courses, or even in the best secondary school traditions, they had to "spoon feed" a lot of students, leading them through the steps by hand, and probably ending up with unhappy students, needing to be "pacified" one way or another.

We were particularly interested in the utility teachers saw in probing pupil responses to tease out the logic of their incorrect responses. We asked our sample of mathematics teachers in secondary schools and our sample of elementary school mathematics curriculum coordinators to respond to the following scenario:

Scenario V

Please consider this dialogue as a teacher visits a math consultant:

Teacher: I gave 2 + .3 = ? to Tom. He rewrote it on his paper like this: and wrote down the answer, .5 and said, "point five."

$$\begin{array}{r} 2 \\ +.3 \\ \hline \end{array}$$

Tom works hard. I believe he likes the individualized math program that we have here in the sixth grade. He has had those problems lots of times. He may not get them right the first time, but he corrects them and is done before the other kids!

I drew three rectangles and asked him to show me what 2 + .3 would be, "using rectangles." He divided one into ten parts, shaded 3 of the parts, then shaded the other two rectangles and said, "The total is two and three tenths."

I pointed back to the .5 and said, "This answer is different. Which is correct?" He said, "Both are correct." I said, "But we started out both times with the same question. How could both answers be correct?" He said, "It depends on the key."

And I guess Tom taught me something when he said, "I'll show you. If I have the problem 2 + .3 = ? and I put down 2-3/10 for my answer, I get it marked wrong. If I have this one (pointing to the rectangles) and I put down .5 I get it wrong. So to get it right, I have to figure out what the key wants."

Mathematics Consultant: This is not uncommon in these individualized programs but I never heard it expressed with such conviction.

I doubt if you can change his view of the "arbitrariness of scoring-keys" overnight. Lots of kids think math is just a bunch of disconnected rules. Emphasizing "place value," that you can't put 2 and .3 in the same column, seems unrelated to the idea of 3 parts out of 10, 3/10.

What I would look for is the "analog" he has, the incorrect rule that does allow him to put 2 and .3 in the same column. What is his logic? If you find that, you may be able to persuade him that the answer ".5" will always be wrong to this question.

Teacher: Are there some materials I could use to help with this problem?

Mathematics Consultant: I know of some you could try, but you will have to have time to study them carefully yourself. Students see the different formats and conclude that "each is a different kind of arithmetic."

Scenario V

It was interesting to compare their responses. They suggested in Questions 1, 6 and 7 (especially where marked †) that elementary supervisors saw a condition that secondary school math teachers were less aware of. In our review of the data we noted that teachers were more involved in the designation of able students for awards and admissions and supervisors often had greater opportunity to study the epistemological problems. Question 1 was:

> Have you found bright students in mathematics classes who are somehow unable to discriminate between significant and insignificant details, bright students who fail to get the "big picture?"

Their responses were:

	K-6 Math Supvsrs.		7-9 Math Teachers		
	N	%*	N	%*	
†	61	50%	32	34%	It is rather common
	48	50%	42	55%	There are a few cases
	3	1%	7	11%	Do not know of any such cases
	112		81		Number responding

> On open ended Question 2: If you were Tom's teacher, how would you deal with this problem of his? The initial categories set up for coding responses were:

	K-6 Math Supvsrs. N	7-9 Math Tchrs. N
Try to understand his "logic" then modify teaching method or materials.	5	1
Reteach place values.	8	9
More drill work.	1	3
Ease up/get someone else to tutor	0	0
Other	68	56
(No comment)	34	12

With additional categories of response created a posteriori, we found the results listed on the next page. Overall there was little difference in the patterns of response. However, the codes gave the impression that the supervisors used more sophisticated language to describe and prescribe what to do.

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*All percentages given in this chapter were weighted according to the RTI sampling plan. See Chapter 18.

Table 16-2: Response Categories to the Question, "How would you deal with Tom's problem?"

7-9 Math Tchr		K-6 Math Supr	
1		7	A. Manipulable objects and representations of familiar objects
2		7	1. Tangible, "concrete" manipulable objects (e.g., Dienes' blocks)
4		9	2. Drawing, "semi-concrete" representations (e.g., rectangles, pies)
6		6	3. Imagining practical, real-life situations (e.g., money)
13	<	29	
1		7	B. "Abstract" manipulation of symbols, rules, techniques, notation
30	>	18	1. Vertical columns with place value labels, decimal points, etc.
1		1	2. Common fractions, mixed numbers, equivalent fractions
0		2	3. Horizontal, equation-style notation
0		2	4. Integers
32	>	30	
1		1	C. Equivalences
15		7	1. Between different numerals, expanded notation (e.g., 4 = 4.0)
12	>	12	2. Between common and decimal fractions
1		2	3. Between "concrete," "semi-concrete," and "abstract" quantities
2		2	4. Between integers and common fractions
1		0	5. Between fractions and division
32	>	24	
0		1	D. Mathematical ideas
3		2	1. Part-whole relations
4		4	2. Wrong procedures, wrong answers (one answer for each problem)
0		2	3. Inequalities
0		2	4. Value of procedures, concepts, symbols, etc.
6		5	5. Independence of key - rationality
2		2	6. Adding like quantities only
1		0	7. Analogy with other bases than ten
1		0	8. Rules are like laws, necessary for harmony and communication
1		0	9. What problems state or imply is important
18	>	18	
0		0	E. Teacher activities
32	>	22	1. Explaining, telling, showing how, reviewing, emphasizing for Tom
8	<	16	2. Questioning, exploring, diagnosing, testing, listening to Tom
1		5	3. Feeling challenged, angered by Tom, is he phony?
0		5	4. Encouraging and guiding Tom
12	>	12	5. Assigning, specifying, drilling, supervising
0		3	6. Analyzing own teaching
7		7	7. Analyzing key & marking system
2		0	8. Informing pupil of progress
62	>	70	
0		0	F. Tom's activities
0		2	1. Discussing with teacher, other pupils
3		6	2. Discovering, calculating mentally, reflecting, experimenting
0		3	3. Explaining, drawing, showing, etc.
1		1	4. Exploring, questioning, challenging keys
2		4	5. Evaluating own work
6	<	16	
0		0	G. Arrangements
3	<	11	1. One-on-one, Tom and teacher
1		4	2. Small group, informal peer discussion
1		1	3. Large group, formal
1		2	4. Persistence over time
1		0	5. Non-individualized
7	<	18	
12	<	34	NO ANSWER GIVEN TO THIS QUESTION
170		205	Total entries in response categories
81		116	Number of respondents returning questionnaire
3	:	4	Approximate ratio of groups

Scenario V continued

We have placed an inequality sign between the numbers of entries in a given categor; where the numbers are large enough to suggest some possible trend. However, we have not computed %s or standard errors since there were an average of about two entries in responses categories for each respondent. The inequalities are consistent with two possible hypotheses: (1) that K-6 math supervisors who had an enormously varied list of actual titles) were better trained in mathematics pedagogical theory than 7-9 mathematics teachers and (2) that K-6 math supervisors are more experienced in the informal methods acceptable in many elementary schools than 7-9 mathematics teachers.

Possibly more interesting than the distribution of these very heterogeneous responses are the explicit formulations two junior high school math teachers gave to the moral uses of mathematics. One wrote in response to the question.

> I would not have gone to the rectangle method. I would have discussed place value instead. Also, I emphasize that rules like laws must be followed if society is to progress and communicate.

The other wrote a lengthy reply which included these remarks, making a religious metaphor of conversion to the confession of error.

> *I find that on the high school level, a student with such a background is impossible to teach until he can admit that maybe he may have been using erroneous logic. That's very difficult to elicit from the student. In our school, I teach all low-proficiency students. . . . Once I can get them not to be ashamed of deficiencies in addition facts, for example, progress can be made doing something about these deficiencies. Sometimes this takes a year for some students, if this conversion takes place in a group, the results are even more fantastic. Then we are in this learning process together with group support.*

Question 6 was:

> As you look at mathematics courses in your school and elsewhere, you probably see things that concern you. Please check those things below that you consider to be major problems. (Check any number)

112 of 198 K-6 Math Supvsrs. N	81 of 150 7-9 Math Teachers N	
+ 67	69	- students have been promoted without knowing basic mathematics
+ 40	14	- too little emphasis given to the "big ideas" of mathematics
+ 63	32	- too little attention to the "logic" students use to get wrong answers
+ 39	49	- the curriculum under-emphasizes the basic skills
19	15	- the public and administrators are pushing for the wrong things
48	32	- too little attention is given the individual student as a person
62	25	- too little help is available to the teacher with teaching problems
23	26	- class periods are too short, classes too large
+ 16	31	- textbooks or workbooks for basic math inadequate for older students

Scenario V continued

Question 7

	116 K-6 Math Supvsrs		81 7-9 Math Teachers		
Most seventh grade teachers are disappointed with the skills and knowledge children have when they arrive in September, finding them not ready for seventh grade lessons, needing relearning or even new learnings to get ready. And so with the sixth grade teacher, and the fifth, and so on down. Is this not so?	N	%*	N	%*	
This is the way it is.	94	79%	55	69%	†
This is not the way it is.	13	16%	13	9%	
Most teachers assume that it is their responsibility to get children ready for the lessons of subsequent years. Is this not true?					
It is true.	88	86%	63	88%	
It is not true.	17	9%	7	5%	
I don't know.	6	5%	7	7%	
But, examining their own lessons, the projects they assign and the learning experiences their pupils are having, many teachers recognize that they have much broader aims than just getting the youngsters ready for next year's learnings. It distresses them to think of diminishing the broader aims in order to spend more time on the particular skills and knowledge the next teacher may require. Is this not so?					
That is the way it is.	65	69%	35	43%	†
That is not the way it is.	25	20%	26	31%	
I don't know.	14	9%	17	26%	
How do you feel? Should most math teachers reconsider the lessons, the projects, and the experiences in their own class toward the purpose of getting youngsters better prepared for the lessons of the next year?					
Yes, definitely.	42	62%	39	52%	†
No, the broader aims are important too.	50	33%	26	31%	
Other.	10	5%	11	17%	

*The percents were based on the 116 of the 198 supervisors responding and the 81 of 150 teachers responding. Percents were weighted according to the RTI state by state sampling plan. Standard errors are given in Chapter 18.

The preceding item was one of the most interesting to us. We wanted to confirm the observation that the preparation ethic (as discussed on page 12:16 and in an earlier part of this chapter) was very strong in the American schools and yet that it conflicted with a belief that teachers had that certain social and intellectual experiences (as discussed early in Chapter 15), broader than course prerequisite skills and knowledge, are at least as important. These data supported both those ideas. A conflict exists between the narrow pursuit of the "basics" and the programmatic intent of many teachers. The fact that the teacher is not highly exposed to the public, that many parents share those ideals, and that many of the youngsters learn the basic skills regardless of what the teacher does probably keep it from being a serious conflict.

TEACHER SUPPORT

In The Unseen Revolution, Peter Drucker referred to the power and sweep of current population changes as a "true revolution," likely to rival Communism and the Industrial Revolution in terms of impact on individuals, families, and societies. "So far," he asserted, "only American society has even tackled the issues of this demographic revolution."*

The case studies and assimilation chapters document the effects of this response on public schools; poignant remarks by teachers, parents, administrators, counselors and students added a human dimension to Drucker's rhetoric. Given its traditional reliance on teachers functioning alone in classrooms with groups of children and adolescents representing the vanguard of this change**, how can the school effectively operate?

In this section we reflect upon support systems for the classroom. To date, most of these systems have added to the labor-intensive nature of education. Fiscal constraints and new priorities suggest that this pattern cannot be continued in the future. Two recent statements outline the dilemma. Calling for a "reassessment of conventional wisdom," Jonathan Sher advocated less employment of rural school consolidation, greater use of "regional service centers" and community-based support systems.*** Meanwhile, the economist Hyman Minsky warned that the "Roosevelt reforms" of the 1930s, though valuable in

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*Peter Drucker. The Unseen Revolution: How Pension Fund Socialism Came to America (New York: Harper & Row, 1976), Chapter 1.

**at a conference on "Communications" we heard the expression: "For teachers McLuhan was a prophet; for students he was an historian".

***Jonathan P. Sher, ed., Education in Rural America: A Reassessment of Conventional Wisdom (Boulder, Colorado: Westview Press, 1977), Chapters 2 and 7.

their time, now obstruct the path of a "progressive and humane society." He concluded with words very similar in meaning to passages found on pp 17:23 and 17:24.

> *Policy must move beyond maniputation within our institutional structure and forward to another creative era of institutional reform.**

Curriculum Coordination. An URBANVILLE site visitor summarized the attitudes of school people, parents and students toward support for teachers (p 5:23):

> By and large, (they) were pleased with the programs of course work in their schools (but) expressed reservations about support from district offices. . . .

In many systems the school district person most responsible and involved in helping teachers with pedagogical and curricular problems was the curriculum coordinator or supervisor. More than other school district personnel, the curriculum supervisor was expected to have responsibility for maintaining and improving the instructional curriculum. Having passed historically from the teacher to the principal to the superintendent, curriculum coordination was (in many districts) eventually delegated to supervisors--advisors and senior educators who would coordinate efforts. The arrangements varied greatly. What the historian found in 1977 was a diffusion of titles, multiple responsibilities, and varied procedures for sustaining and changing curriculum practices in classrooms. The lack of clearly defined procedures for delivering curriculum and staff development--according to Unruh and Turner--led to so much overlapping of responsibility and unnecessary confusion that the effectiveness of instructional supervision has been impaired.*

Understaffed, advisory in nature and usually lacking in political power, unacquainted with the hostility and disorganization of the more recent confrontations, often untrained for the job and reassigned new obligations as part of frequent district reorganization, and with a tradition of teachers in control of the classroom, supervisors faced an almost impossible task. Supervisors of course were limited in authority either to "install" and nurture district-selected curricula or to help teachers with problems. But some saw it differently. A principal in RIVER ACRES pictured his authority in curriculum planning (p 1:9):

> *You want to know why I'm boss here? I'll tell you why I'm boss here. Because I have authority. You need coordinators (at the district level) with real clout if you want an integrated, funnelling program. You need people with authority, not with "supervisory" capacity. That's the way things get done in Texas. Until that happens each principal will run their own school the way he wants to. When the Associate Superintendent speaks, we do it. The others muddy the waters.*

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*Adolf Unruh and Harold E. Turner, Supervision for Change and Innovation (Boston: Houghton Mifflin, 1970). Some critics are quick to presume that organizations have vague charts with little explication of responsibilities that are ineffective. The current problem with curriculum coordination probably lies elsewhere.

Our case studies did not focus on district programs or responsibilities. Still, hopeful of providing the National Science Foundation with information for planning support programs we took the opportunity in the national survey to find out more about the people who coordinate district curricula.

The range of titles used by K-6 math supervisors* in answer to one of our survey questions impressed us as the tip of the iceberg of organizational patterns for managing the curriculum, and of the amorphous quality of the supervisor's role:

science-math supervisor
math supervisor
math coordinator
math department chairman
teacher of gifted and talented
principal
curriculum consultant
math consultant
math-science consultant
classroom teacher of math 5-6
general elementary supervisor
instructional consultant
assistant director of math K-6
Title I coordinator
elementary education supervisor
math specialist
assistant superintendent for elementary
assistant superintendent for instruction
elementary curriculum coordinator
math resource person
field consultant
coordinator math pilot project

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*The people we called curriculum supervisors or coordinators in our national survey were those people named by the superintendent as in charge or most knowledgeable about the district program. Research Triangle Institute obtained the samples by asking superintendents for the names of curriculum supervisors. Their request went on to say: "If there is no district supervisor for a particular category, please provide the requested information for the district staff member who would best be able to answer questions concerning the district program in each subject area and grade range. This person will usually be a member of the central staff, e.g., the curriculum director, the assistant superintendent for instruction, or the superintendent. It is possible that one person could be designated to provide information for two or more categories; we have designed the questionnaires so that each person will be able to provide all of the required information in less than 30 minutes."

At the secondary level their answers revealed a preponderance of administrative and teaching loads over supervisory tasks. About half the respondents at the elementary level had supervision as a primary assignment:

	K-6 Sci	K-6 Math	7-12 Sci	7-12 Math	7-12 Soc St.
	N	N	N	N	N
Curriculum Supervising	67	59	33	34	50
General Administration	31	25	11	16	17
Teaching	27	20	35	41	28
Department Head	1	1	8	4	10
Other	5	5	50	35	46
	131	110	137	130	151

(Using the weights provided by RTI, the percent of people who had supervising as a primary responsibility in each of the 5 categories, all treated as supervisors, were respectively 37%, 24%, 4%, 13% and 16%. The weights reflected the huge number of small superintendencies in the United States.)

We asked about the percent of their employment they devoted to supervising, coordination or consulting with teachers on instruction:

	K-6 Sci	K-6 Math	7-12 Sci	7-12 Math	7-12 Soc St.
10% or less	22%	26%	56%	30%	32%
11% to 25%	17%	37%	13%	13%	26%
26% to 50%	18%	16%	10%	14%	14%
51% to 75%	19%	11%	4%	12%	7%
76% to 90%	4%	7%	2%	2%	17%
90% or more	20%	3%	5%	28%	4%

A substantial proportion were supervising other curriculum areas besides the area (science) (math) or (social science) for which they were asked to respond in the survey.

Do you supervise curricular matters in areas other than (science) (math) (social science)?

	N	%	N	%	N	%	N	%	N	%
Yes	86	67%	65	79%	47	65%	53	59%	64	55%
No	44	34%	45	21%	86	35%	75	41%	82	45%

We asked: to how many teachers do you provide consultation and aid? The medians were as follows:

K-6	science coordinators	: 300 teachers
K-6	math coordinators	: 477 teachers
7-12	science coordinators	: 219 teachers
7-12	math coordinators	: 251 teachers
7-12	soc st coordinators	: 251 teachers

We had expected such a degree of specialization in the schools that each district would have a person more-or-less in charge of coordinating the curriculum in each of the three areas, social studies, math, and science, and that a substantial portion of that person's workload would be devoted to coordination. We did not presume that that was desirable, just that it would be the case.

What we found in our observations in the sites was that persons in the district office would put out bulletins from time to time on curricular matters, that important planning would be made by committees of teachers and administrators and other resource personnel, and that the teacher seldom was personally in touch with a curriculum coordinator per se. The picture from the survey gave partial confirmation to that, indicating that those most in charge of or knowledgable about the curriculum, as designated by the superintendent, were people who had many and varied responsibilities and could devote only a minor share of their time to coordination, and on the average had in excess of 200 teachers to work with. There were very few people available outside the classroom to provide quality-control for the curriculum and assist teachers with pedagogical problems.

Perhaps one of the reasons why a district would not provide more assistance (suggested in the earlier part of this chapter) was that teachers and supervisors emphasize different purposes and values. Lou Smith reported a dilemma of this sort in ALTE (p 3:25f):

> First and perhaps foremost is the tension or dilemma between the bureaucratic/organizational tendencies and the individual/professional tendencies. On the one hand the organization is continually striving for rationality--agreed upon goals and priorities, clarity of procedures and organizational mechanisms, responsible supervision. That is, there are committees with domains of activity and chairmen responsible for their functioning. On the other hand, . . . there are highly trained, competent professionals in schools and classrooms who are selected, hired, and expected to know what to do in their own domains, to choose and decide intelligently and responsibly, and who exercise and enjoy their autonomy.

Perhaps the more advanced training a supervisor or curriculum coordinator receives the less likely he/she is to be sympathetic with the uses teachers make of math, science or social studies to socialize students into the school's behavior norms and the more

likely they are to stress intellectual motivation, interesting materials and devices which teachers fear will make their pupils dependent on them and unwilling to tackle the drudgery they see ahead.

Whether or not teachers want help from curriculum and pedagogical specialists is an interesting question. Not unexpectedly, they wanted more of the good help they had had and less of the bother masquerading as help. A high school science teacher in BRT expressed an unusual point of view (p 4:7):

> *There is one thing I miss about a larger school though. The one I was at before gave a free period to the department chairman and he'd come watch us teach and offer constructive criticism. . . . There's no one in my area who can come and say, "Now this might be a better way to do this."*

Many were dubious that the district, or the college of education, or any other agency would have someone who could help. But still most were willing to try. We did some checking as to what service or help they wanted from a supervisor.

When survey respondents ranked the importance of five responsibilities of the science curriculum supervisors, assistance to teachers with teaching problems ranked highest. In regard to coordinating testing with curriculum development, respondents did not see that the curriculum people are insufficiently governing the testing. Supervising the collection of student performance data ranked low.*

> Please rank the importance of responsibilities of a science curriculum supervisor--as you would like it to be. Rank "1" as the most important on down to "5" as the least important.
>
> Importance of responsibilities of a science curriculum supervisor
> ...as K-6 science supervisors would like it to be:

Median rank	
1.3	Assist teachers with problems they are having with teaching
2.0	Provide information about different teaching methods and materials
3.1	Assure that a high level of subject matter is maintained
4.1	Assist administrators in getting funding for programs
4.3	Supervise the collection of student performance data

> ...as 10-12 grade principals would like it to be:

1.6	Assist teachers with problems they are having with teaching
2.3	Assure that a high level of subject matter is maintained
2.3	Provide information about different teaching methods and materials
4.3	Supervise the collection of student performance data
4.4	Assist administrators in getting funding for programs

*See (p 18:50) for further explanation of this ranking.

When survey respondents were asked about talents or background experiences supervisors should have, they seemed to be indicating what it takes for supervisors to gain credibility with teachers--recent full-time teaching experience. They also revealed the kind of help teachers have said they want when they indicated the importance of other background experiences of supervisors--especially skill in diagnosing individual student learning difficulties, and knowledge of sources of curricular materials. Teachers saw little opportunity or need (we don't know which) for supervisors interpreting testing in the district and classroom. This seemed to say that it is more the responsibility of curriculum coordinators to help fit curriculum to the testing than vice versa. We asked:

> Which of the following background experiences or skills do you think are highly valuable for a (mathematics) (science) curriculum supervisor or coordinator? (Check as many as you wish).

	K-6 Math Supervisors %	7-12 Sci Supervisors %	K-6 Principals %	K-6 Teachers %
Recent full-time teaching experience	89%	59%	96%	97%
Administrative experience	45%	58%	35%	20%
Continuing enrollment in graduate (math) (science) course	43%	19%	31%	27%
Having done curriculum research and development	36%	26%	35%	36%
Skill in diagnosing individual student learning difficulties	83%	76%	43%	83%
Skill in arranging inservice programs	50%	38%	73%	45%
Skill in interpreting test scores for whole classes or schools	54%	53%	30%	42%
Knowledge of recent (mathematics) (science) discoveries	64%	35%	39%	64%
Knowledge of sources of curricular materials	82%	89%	89%	71%
Ability to "speak out" to protect the curriculum	68%	73%	35%	64%

While principals and supervisors divided their opinions, parents thought teachers to be not only in the best position to be knowledgeable about curriculum needs, but also to be the experts, when we asked:

In your district who is the person (or who are the persons) most knowledgeable about whether the curriculum needs improvement of one kind or another?	K-6 Science Supervisors	10-12 Principals	Parents Seniors
Superintendent or Asst or Assoc	11	2	14
Principal	22	13	14
Curriculum personnel	39	19	8
Teachers	49	16	22
Students	2	1	4
No one knows	2	0	1
I don't know	0	1	26
Other	7	1	24

Teachers expressed concern about the lack of material support and with the organizational problems of teaching, less about the poor state of inservice training. Teacher educators had been stressing the importance of inservice training in the next decade, but many teachers did not consider that a major need. Perhaps again they seeing inservice personnel all too seldom oriented to helping teachers with existing problems or with adaptations of subject matter to fit the abilities and temperaments of the students, and not expecting that investment there would pay off.

Support systems were very much a part of the political side of schooling. In ARCHIPOLIS observer Hill-Burnett discussed the impact of decentralization on inservice support (p 9:3):

> From the teachers' point of view, before the "decentralization plan" had gone into effect, the central board of the school system had provided "department" (translate that subject-matter) specialists to go to local schools. Their activities and functions had varied somewhat from elementary, to junior high, to high school. At all these levels, the teachers now expressed some sense of loss about those functions. They still dealt with the district office for support personnel; but the support personnel were no longer categorized by subject, or "departmental," specialization. They further saw the process of securing help from these personnel as a question of new competition for resources, perhaps challenging budget priorities in the local school. The decision about when to call the support service was transferred to the local school and the teachers in it.

In RIVER ACRES, a teacher described to a site visitor the district's policy on supervision:

> *Supervision is "nowhere." The [school] board feels we have too many administrators. They fail to make the distinction between administration and teacher in-service help. This means curriculum construction and implementation is pretty much editing in the district office. No help goes to the classroom teacher directly.*

And another said of science activities and investigations; and their implementation:

> *Elementary science is an unnecessarily scary thing for teachers. The technical complexity is not that great. Teachers really do not need to know that much. It is just that we are not prepared to teach it, have bad memories of freshman biology in college, and get no in-service help to speak of (p 1:25).*

Terry Denny commented on one kind of help teachers asked for on p 1:32 of RIVER ACRES:

> Teachers did not call for research or for evaluation of instructional materials or the curriculum. They want help, now. They have three widespread concerns. My notes contain thirty-seven separate pleas (not all elementary) for materials, procedures, aides, or supervision for slow children in mathematics. The harshest self-criticism made was in the mathematics instruction of students in the lower levels.

Teachers there called for inservice cross-grade meetings and vertical communication to replace "failure" of supervision to coordinate the curriculum (p 1:38f).

Continuing Professional Education. Our observers found the teachers engaged in occasional staff meetings, a diminished program of inservice training, and some continued enrollment in university courses. Some districts were increasing the formal obligation of teachers to be explicit about their professional growth goals for the year, but even there the continuing professional education activities were meagre.

Three reasons were heard: (1) the number of inexperienced teachers on the staff was smaller;(2) the incentives for earning course credits and advanced degrees have diminished; and (3) the money available to support resource persons has also diminished.

Staff meetings appeared to be for the purpose of improving organizational arrangements and distributing information rather than for the purpose of giving assistance to the teacher with pedagogical problems.

We heard some comment about increased involvement of union and professional organizations in providing inservice training, but for the most part teachers and administrators expected the responsibility to continue to be shared by teachers themselves and college professors.

To help us understand what school people thought universities might do to assist in inservice training, a Scenario X survey item was put this way:

> One Cyrus Knight School teacher said, "Schools and universities are headed in different directions. Schools want more and more to teach what parents and students believe is useful. Universities want to stress theoretical ideas, the search for Truth." Is this a problem?

7-12 Math Supervisors		7-9 Science Teachers		Responding
N	%	N	%	
36	18%	35	30%	No
24	27%	14	29%	It causes some problems, but that is just the way things are.
15	29%	11	12%	Yes, a problem, mainly because schools no longer see what education is.
9	9%	9	13%	Yes, a problem, mainly because universities just are not interested in people.
44	17%	23	16%	Other

Despite the different educational aims advocated by the curriculum developers and science education specialists, as compared with many teachers in our sites, the differences between most university faculty and school teachers did not appear highly troublesome to these respondents. When we asked what universities could do to help, we found that what is wanted is pretty much what universities are now doing.

What could universities do to be of most help to teachers?
(check only one)

7-12 Math Supervisors		7-9 Science Teachers		Responding
N	%	N	%	
21	23%	26	43%	Develop curricula appropriate to the times
27	13%	16	16%	Run inservice workshops and institutes
26	27%	15	12%	Offer courses oriented to teacher needs
4	0%	5	3%	Establish teacher centers
6	3%	6	6%	Sponsor teacher networks for mutual help
44	33%	23	20%	Other

Survey respondents were also asked about what the federal government could do to support science education teaching in the schools. Four forms of inservice services were ranked the highest:

Hire and pay resource people to help teachers with their teaching skills.
Provide additional institutes for the improvement of teaching.
Develop science courses oriented to present and future job markets.
Provide films and lab materials to schools at low cost or no cost.

We were surprised to find these ranked toward the bottom:

Provide free telephone networks for teachers to help other teachers.
Undertake a public campaign to promote "scientific literacy."
Subsidize the early retirement of ineffective teachers

Because the National Science Foundation has a high responsibility for providing support for science teachers (including math and social studies teachers), we asked about support. Several items in the survey suggested how different groups see ways that a supervisor might be of help to teachers. Math teachers appeared to most want specialists who write and arrange things for teachers. They also expressed interest in help, especially with diagnosis and with other staff development activities. We were surprised to find so little support for teacher-run institutes. Teacher centers were supported more by elementary

teachers than supervisors perhaps because such centers operate outside the usual lines of supervision and stress the authority of teachers over the curriculum.

The following support* could be implemented at the district level:

What sorts of support do teachers in your schools need? (check any number)

116 K-6 Math Supvrs N	81 7-9 Math Teachers N	Responding
49	26	specialists who visit each classroom perhaps once a month
59	39	teacher centers where teachers can take their problems
11	8	toll-free telephone numbers teachers can call for help
67	50	a network of teachers willing to help with diagnoses

Which of the following do you believe are of substantial help to teachers having problems teaching basic math? (check any number)

116 K-6 Math Supvrs N	81 7-9 Math Teachers N	Responding
17	12	university courses in math
41	31	university courses in math education
52	36	staff development featuring presentations by visiting experts
90	40	staff development seminars with other teachers talking to a consultant
62	45	staff development workshops involving only the teachers

*Other teacher suggestions about inservice support activities may be found in answers to open questions in Chapter 18.

What is your feeling about summer institutes such as NSF has sponsored? (These are institutes involving full-time enrollment in special sections of college math or science courses, with some help from education professors.) Check one or more.

116 7-12 Math Supvrs		81 7-9 Sci Teachers		Responding
N	%	N	%	
86	54%	49	53%	They do a good job of giving teachers ideas, contacts, and confidence.
25	25%	10	15%	They are good for good teachers, not very helpful for teachers really needing help.
18	13%	9	9%	They are not as valuable as institutes run by experienced teachers.
66	37%	42	52%	There should be more of them so that all teachers needing them could enroll.

A sizeable proportion of the science teachers in the sites had attended NSF Institutes.* The percent in each category who had been to at least one Institute were:

Teacher sample	Responding yes		Average number of institutes (weighted)
	N	%	
Science: grades 7-9	39	41%	3.0
Mathematics: grades 7-9	24	31%	3.2
Social studies: grades 7-9	7	12%	1.3
Science: grades 10-12	52	46%	1.3
Mathematics: grades 10-12	38	31%	3.2
Social studies: grades 10-12	4	10%	2.5

*See (p 18:23 for report of data on participation in inservice and preservice courses in addition to NSF Institutes.

A math teacher at WESTERN CITY said (p 7:35):

> *The NSF Institutes that I attended were well worth all the money. I'm sure that if I had not attended these institutes I would not have been able to do as good a job as I have done. A college graduate with a degree in math is not really prepared to teach high school. They don't teach you how to deal with kids and you also don't get much of a chance to get your head together with respect to math instruction. All math teachers should be encouraged to take an NSF Institute at least every five years.*

One negative comment--in reference to a curriculum institute--came from RIVER ACRES (p 1:158):

> *I believe I was lied to at those institutes. The techniques never did work out right back home. Wisconsin and Kentucky teachers said the same thing to me. It isn't the same back home. The deck was stacked somewhere, teachers looked like they were doing things with the kids that they weren't maybe.*

This criticism seems to be more of "the curriculum" than of the institute, however. The positive feeling toward institutes is also reflected by survey responses to an item asking what the federal government should do to support science teaching in the schools. The respondents were to check three things from a list of eleven that they felt most worthy. One choice was "provide additional institutes for the improvement of teaching." The percentages of respondents selecting this choice were:

46%	Administrators
61%	Curriculum Coordinators
31%	Teachers
24%	Students
32%	Parents

Responses to another survey question indicated again the lack of support among teachers for teacher-run institutes but indicated the preference for additional expertise.

That the institutes have been seen to have a good impact seemed clear. Among many federal programs of support for curriculum and teaching, the institutes were mentioned to us most often and in a positive vein.

A science education consultant in a State Department of Education volunteered an observation of support for this point. He wrote:

> *. . . the inservice institutes that NSF sponsors are perhaps the only well planned, well thought out inservice experiences science teachers are exposed to.*

The cynic might say that the positive effect stems from the financial support that teachers received and the opportunity to socialize. Very likely these were factors. But it also seems likely that the respondents were candid when they said that institutes have contributed much to teacher effectiveness--acquainting them with different ideas, content, and techniques or teaching.

We found substantial need for pedagogical support for teachers. Many of the good ideas of supplementary centers, intermediate districts, and teacher centers had not caught on--for reasons we did not understand. But there was a need for materials, for organizational assistance, for relief, and occasionally for help in understanding individual students. There continued to be a very good feeling about the NSF teacher training institutes, and many teachers and administrators told us the "course content" institutes should be extended to the many teachers who ahve not had a chance to benefit from them. Institutes based on the use of expensive materials or new departures for teachers weren't in high demand partly because local funds and innovativeness have ebbed. As a group the teachers we became acquainted with in these studies wanted to extend their continuing professional education. Many felt that additional ways for teachers to share experience and problems needed to be found.

Technology. National concerns about education were not often given focus in the CSSE classrooms, but instructional arrangements made at state and district levels did reflect some national issues. In response to poor student performance on tests, to other embarrassments such as nationally publicized lawsuits brought by nonreading graduates, to a belief that technology can improve the efficiency of instruction, and to a perceived need for more control over the whole teaching-learning system, a nationwide effort has been undertaken to make teaching more explicit, more rational and to make learning more uniform and more measurable. Technology as we saw it did not necessarily mean mechanical or automated devices, but any effort to routinize or standardize procedures either for students or teachers. Thus flash cards, workbooks, and formal plans were as much instruments of technology as computerized math lab and automated reading lab learning systems (p 11:34).

The effort towards systematization appeared to have some effect on what teachers talked about, and some even on what they did. Many teachers appeared to be convinced that teaching and learning should be more efficient. They seemed to prefer efficiency gained by increased teacher control while the districts seemed to prefer gaining efficiency by explication and simplification of what was to be learned. For the most part teachers we saw cooperated with district efforts to improve efficiency through procedural technolization.

In the eleven sites we found teachers using highly routinized instructional procedures, i.e., a technology of teaching. They were structured by specification, hierarchial order, strict time allotments, and the like. They stood in contrast to the more spontaneous and responsive behavior of the Mr. Chips kind of teacher. The highly structured textbook science class in ARCHIPOLIS (p 9:7ff) was a good example of this instructional technology.

We found teachers and other school people largely agreed on the importance of an orderly classroom, objectification of the syllabus, and a strict concern for teacher-time costs, as demonstrated in Scenario W (p 18:44). Our results showed that about half the principals and teachers surveyed agreed with using workbooks, worksheets, and textbooks to keep pupils busy and productive--and our observations and interviews put the support even higher.

This somewhat "industrial" concept of in-class management seemed common. Teachers prepared their schedules to allow for introduction of new material, discussion, problem solving, homework review, etc. A further example of time management was the development and use of prepackaged individualized learning systems.

Whether the curriculum was to be technologized commercially or locally, the first step was usually to obtain widely-acceptable statements of school objectives, reducing the number of paramount things to be accomplished, diminishing the differences to be noted between classrooms and between classmates, and drawing community attention to those school purposes that all agreed upon. The second step was usually to identify criterion performance items, with or without tests, but visible outcomes appropriate for assessing student accomplishment of the objectives. It was presumed that lack of accomplishment would require additional study or that teachers would know how to modify instruction. This remedial part was not as highly technologized, except in certain "individualized" systems such as IPI (which we encountered in ALTE, p 2:14) and Project PLAN (FALL RIVER, p 2:20).

Highly technologized individualized-learning systems like IPI and Project PLAN were being used more as supplemental than central to a district program. (See Chapter 13 section on molecularization and sequencing, p 13:43). Teachers using them some places altered the system of individualized instruction by choosing their own objectives and materials to flesh out the pre-packaged system--for instance in RIVER ACRES (p 1:51). In BRT (p 4:31) though, a contract system was used in which the student and the teacher negotiated the conditions necessary to earn various grades. Although the idea of individualized instruction is that the student can find his/her own way through the system or contract, the RIVER ACRES case demonstrated that accommodation to the demands and requirements of each student's learning was not always smoothly accomplished (p 1:51):

> *If my student is absent when the first cassette in a series is in the room, it is quite likely he will never hear the cassette. If the second cassette builds upon the first cassette, too bad.*

Structured programs aimed at efficiency, uniformity and measurability were not welcomed by all teachers as contributions to learning or to maintaining order in the classroom. In FALL RIVER (p 2:9) one noted:

> *I always thought that the main goal of education was teaching kids; now I find out that the main goal is management.*

The intention of learning systems was to bring efficiency and organization into the classroom. But the systems often proved to be unexpectedly demanding both in the amount of time required to develop or enact the systems and in the time required for subsequent bookkeeping (see p 15:12). Observer Terry Denny commented on the time requirements of these systems in RIVER ACRES (p 1:52) as did observer Mary Lee Smith in FALL RIVER (p 2:3).

Despite these very real concerns with systemized instruction, administrators at many of our sites spoke highly of their technological efforts. Many teachers spoke highly of the increased manageability of instruction through objectification but objected to instructional time diminished by the amount of testing and were apprehensive about what might be done outside the classroom with the test scores. In districts where objectives were formalized and tests were required the teachers

were less enthusiastic, but many continued to appreciate the order and assurance that such systems brought to their teaching. We did not run into any situation or even any "folklore stories of far-off places" where the objectives-based systems had in fact substantially changed the achievement levels of the youngsters.

What has been said in this chapter is that it became clear from some of our case studies, some classroom observations by site visitors, some responses to questionnaires, and from tape recordings of site visitor interviews with teachers, that the responsibilities (for which most teachers felt very strongly) regarding the management of the class and the development of study habits and individual personal character were not to be taught just prior to or independent of the subject matter. They were to be an integral part of all the reading. These responsibilities were seen to limit strongly the conceptions of science, the methods of instruction and the materials of instruction. Teachers used the curriculum material selected for academic goals for the socialization of pupils instead, and for developing individual attitudes of responsibility expected by teachers in the next grade. In their "pastoral care" or socialization role, teachers represented adult society "shaping up" youth.

Since there were strong societal, institutional, and professional expectations that subject matter be covered, it was to teachers a matter of efficiency to use the subject matter in part to accomplish socialization goals. But teachers had to develop their techniques for these uses of subject matter largely on their own or with the help of other teachers in the same school, because neither preservice nor inservice teacher education programs provided much help. Some found assistance in technology for their difficult socialization and intellectual goals and most searched for more help from wherever it might come.

Chapter 17

THE SCHOOL AND THE COMMUNITY

The management of social institutions in technologically-sophisticated societies is a most complex and difficult task. Educational institutions are no exception. Our case studies dealt predominantly with formal education in science, mathematics and social studies--but seldom were matters far removed from the problems of managing the school system.

What our eleven school systems had in common, though varying in size and kind, was a large number of people organized into a social unit, a unit established for the explicit purpose of achieving one primary goal: educating youth. Because schools have been formally organized, not just the product of random pressures, they are expected by policy-makers and the man on the street to have been consciously planned and fitted with programs to guide the instruction of pupils.

The planning is ever imperfect. Management--school administration--always has the problems of staff selection and retention, maintenance of the physical plant, financing, organization and reorganization, programming, and student enrollment. It faces the task of satisfying many groups of people--people who have different ideas about the proper and improper goals of public education. We see these goals, the stated and the unstated, reflecting the ideas and influence of teachers, boards of education, parents, businessmen, professors of education, advocacy groups, religious groups, athletic groups, aesthetic groups, and of course, funding agencies such as the state and federal government. And management has its separate goals too. It is a strong political context in which we find the schools. Congressman Richard Bolling recognized it:

> *I would hope that all of you who are disillusioned by the political process, who think you can escape the political process, would recognize that the framework of the society within which you work and plan is based on the political process.**

But there are two very large and surprisingly separate political processes. There is a local political-social reality of the school. There is also a national political-social reality of the schools altogether.

The school of the local community is one thing. The schools of the nation are something else. Somehow, the aggregate of all the local schools is just not what "our national school system" is.

It is partly of course that our schools are not only the creation and vital organ of the local community, but also of outside agencies and interests, governments, suppliers,

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*Richard Bolling, Address presented at Research Utilization Conference, Kansas City, Missouri, October 7-9, 1968, in Preliminary Report of a Research Utilization Conference (Kansas City, Missouri: Institute for Community Studies, February 1969), p. 26.

real estate interests, etc. But there is a more important distinction between this whole and the sum of its local parts. The people see the local school through the medium of personal contact, direct and indirect. They see the national educational system almost entirely through the news and entertainment media. And the two percepts are different in content as well as scope.

It is not unusual to find citizens and teachers thinking of the local schools in terms of taxes, rowdy behavior, sports, and the like. Taxes continue to increase, some bond referenda are voted down at the polls. Some of the new programs in the schools look pretty good, though it seems extravagant to put carpeting on the floors. Many of the youngsters continue to go off to some of the best universities. There is that one school bus they had to put a policeman on. It is sometimes black against white. But the football team has both blacks and whites on it, and they work together pretty well. Such are typical thoughts about the local schools.

And to the extent that they think about the national school system, (which seems not to be very much) they think of what is said in the newspapers and on television, that the U. S. Supreme Court is going to decide whether or not it is all right for less qualified black kids to go to medical school when more qualified white kids are being turned down; that the test scores have been going down for several years; that youngsters who cannot read but who graduated from high school are suing the school for not teaching them to read; that the courts are making the schools use busing to integrate the schools even though almost everyone is against forced busing.

No matter how you add up the local teaching and learning situations, the concerns and accomplishments of youngsters and their teachers, they neither provide the assessment of education we have come to expect from the news media nor face up to the problems that national critics have vividly revealed. Planners of national education programs should be knowledgeable about both realities, the local and the national.

As has been pointed out in eleven case studies and all the preceding assimilation chapters, the teacher in the local school has his/her mind on local problems. We look next at staffing, management, and community relations--conditions that shape each local school's science, math and social studies programs.

STAFFING THE SCHOOLS

In most of our case study sites grade school enrollments were dropping and high school enrollments were starting what is expected to be at least a ten-year drop. In most of these districts the size of the teaching staff has dropped, but to a lesser extent. Attrition of teachers and other staff due to retirement, withdrawal, and promotion has resulted in replacement by transfers within the system more than by new hirings.

There is no typical situation, however. Two CSSE districts were vigorously recruiting new personnel. Another, one of our largest school sites,hired only two new teachers during the year of our observations. The principal of still another school said she could not keep qualified mathematics instructors because the local technical industries paid them so much more.

One school was keeping its enrollment relatively constant by admitting more students from other subdistricts within the city. Some students transfer in because of the

facilities there for physically handicapped students. Another school was finding students transferring back to the public schools from the white academies since parents now see racial integration as less abhorrent than they did a few years ago.

Each place has its own circumstances, but by and large, enrollments in most places are going down and will continue to go down. It affects what the districts do, what the teachers do, and what the curriculum is. Wayne Welch, our field observer at the URBAN-VILLE site, observed:

> The average age of the faculty continues to rise and no new teachers (those entering directly from college) are added to the faculty.

An older, more experienced, less mobile teaching force is not necessarily a problem. But these circumstances narrow the options a district has for deciding what kind of a teaching force it wants. And the unions are at work to limit them further.

Protecting Jobs. It is reasonable to suppose that the number of teachers will be a function of the number of children there are to teach--unless you are one of today's teachers. The teacher works hard, and expects to be rewarded with job security. The teacher thinks, "At last enrollments have dropped to twenty-eight per room. It's still too many to teach in one room. How can they talk about laying off teachers?"

The administrators of the schools see enrollments going down and, with state financial support based on an enrollment formula, they look for a way to trim school costs. With over sixty per cent of total current expenditures* committed to instructional staff** salaries, many do talk about laying off teachers. Declining enrollments are less common in Sun Belt cities and some rural districts. And over half the superintendents responding to our questionnaire said they had not recently had budgets cut; but holding down costs and expecting fewer state funds were common and serious topics of conversation in the schools we observed.

The American Federation of Teachers and the National Education Association have helped teachers increase salaries, for example, from a national average of $7,423 in 1967-68 to $10,114 in 1972-73*** and more since 1973. But they have not in the last decade kept up with wage levels of other public employees such as firemen and policemen**** or the average wages of the American craft union workers.

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*National Center for Education Statistics, Statistics of Local Public School Systems Finance, 1969-70, p. 16.

**Professional instructional staff is defined as teachers, principals, assistant principals, supervisors of instruction, guidance and psychological staff, librarians and audio-visual staff.

***National Center for Education Statistics, Digest of Education Statistics (1973), Table 57.

****For 1972-73, firemen's minimum salaries averaged $9,515 and policemen's minimum $9,963; average maximum salaries were $11,604 and $12,330, respectively. Minimum scheduled salaries for teachers with bachelor's degrees averaged $7,357 for the 1972-73 school year, and maximum scheduled salaries for teachers with a doctorate averaged $14,562. In the five-year period since 1968, the annual rate of increase for policemen's and firemen's minimum salaries was 7.4%, while maximum salaries rose (footnote continued on next page)

Important also to the teacher has been the effectiveness of the unions in protecting teaching jobs. Just ten years ago in most communities a teacher's contract was negotiated on an individual basis. The board had to show little cause for not continuing the employment. Legally speaking, few teachers have tenure today, but the grounds for dismissing a teacher are few and difficult to prove.

As a result of union action, many districts have strong seniority clauses in teacher contracts. The protection is likely to increase as additional states pass compulsory arbitration laws. City schools in URBANVILLE opened late in 1976 because of a strike brought by teachers. One point of contention was a seniority matter, with the union demanding more systematic and coherent procedures when teachers were to be "not rehired." When the strike was settled the union had won more complete dependence on seniority. No value judgment was to be made as to who should and should not be fired.

In our URBANVILLE site it was apparent that the old teachers stay and the new teachers go. Even if the new teachers were to be especially good at any recent thrust of the school, such as the teaching of reading or an emphasis on applied mathematics in such a district--one whose budget requires a reduction in teaching force--the new teachers are the ones who will be told in April that their contracts will not be renewed.

At our URBANVILLE site and elsewhere the school system holds diminishing control over probably the most important determinant of good learning--the teaching positions.

The Urge Not to Change. Of course there still is some turnover. When September 1978 arrives, about five per cent of the 1977-78 staff at a typical school will be gone--promoted, retired, transferred--for some reason leaving a vacancy. Each department, each administrator, has an idea of what kind of person could best fit. Chances are, in most districts, it will have to be a transfer from an overstaffed school or department.

An unprecedented number of certified teachers seek employment. The proportion of education graduates obtaining teaching jobs dropped from seventy-four per cent in 1962 to forty-eight per cent in 1974.* New York City found many in the unemployed teaching pool unwilling to take unexpectedly offered teaching assignments, but the security of the positions offered was low. Some say it should be a time of opportunity for school systems to upgrade their faculties. Clearly there are more capable teachers available to replace the "least effective" ten per cent of any district's classroom teachers.

We did not become aware of an effort at any of our sites to identify the least effective teachers and replace them. Lou Smith described the situation (see p 3:84) in ALTE, our suburban site in the Midwest. He left little doubt that there is fairly general agreement about which of the teachers have "gone stale." The problem, many agreed, is not one of identifying those who are not "strong teachers," but a mechanism for replacing or revitalizing the less effective.

(footnote continued from previous page) at an annual rate of 8.2%. Since the 1967-68 school year, teachers' minimum scheduled salaries increased annually by 5.5% and maximum salaries by 5.8%. Negotiation Research Digest (April 1974), p. 15.

*R. B. Freeman, "Investment in Human Capital and Knowledge" in Capital for Productivity and Jobs, ed. Eli Shapiro and William White (Englewood Cliffs, N.J.: Prentice Hall, 1977) p. 105.

But that too is an oversimplification of the problem. There are many definitions of effectiveness in teaching. And most people will not consider "instructional effectiveness" as a criterion until other qualifications have been met.* It was obvious in each of our sites that the school systems try to hire the "best qualified" candidate from that subpool of applicants who clearly fit into the existing dominant value system of the community. Often, acquaintance with the community is considered an asset for an applying teacher. In one of our sites there was a resentment against a black teacher recently transferred to a predominantly white school, not because he did not know how to teach science, but because he "did not seem to know how to work with youngsters, not, at least, with the kind of youngsters they had at this school."

The main reason teachers are not released if they can be protected is the institutional ethic. If any one is threatened then all are threatened. A sense of loyalty is highly desired, and rating some teachers as more effective than others runs counter to that loyalty. Some parents try to challenge that institutional ethic, but seldom successfully. Three parents in URBANVILLE were talking to the interviewer. One said that weeding out bad teachers did not work

> *because somebody knows somebody, or somebody's scared to do something and no one takes any action. They're afraid of repercussions. . . . I've worked very hard to bring to their attention certain discrepancies in a teacher's attitude and treatment of children--and got nowhere. I was told that the principal had to support his teachers even though he knew I was right.*

Another said:

> *It's impossible to fire anyone.*

And the third replied:

> *I don't want to fire these teachers. I just want them to shape up.*

But in most places the teachers do closely fit the neighborhood majority group's image of what a teacher should be professionally. The large criticisms come from an occasional minority or from those talking about the distant mass of teachers. Boston University's Education Dean Robert Dentler asked:

> *What can people do? We're in a situation where, on many fronts, courts are becoming the last resort for parents and their complaints.***

There is little enthusiasm for affirmative action, except among those groups who would themselves benefit. Almost everyone wants to give the job to "one of our kind." In rural places a board member sometimes sees the job opening as a chance to employ a needy acquaintance, the wife of a friend perhaps, or a relative. Even though a typical, elaborate testing and interviewing procedure was used to screen applicants in our Pennsylvania and Alabama sites, we found the ties of kith and kin throughout the systems.

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*Even then it is recognized that effectiveness in instruction is not a uni-dimensional trait. Ineffectiveness is evidenced by poor performance in one or more of the many responsibilities of an instructor.

**Newsweek, 12 September 1977, p. 70.

Alan Peshkin, our Illinois field observer, once reported (in a case study of another rural site, in press) why a broadly-experienced aggressive young man was passed over as candidate for that district's school superintendent. One board member acknowledged that the other, the successful, candidate had less of a record, adding: "But he's country!"

We saw the same phenomenon in Texas, Alabama, Illinois, and California. In each case the strong teachers were described as being "right" for their school and communities. To many people at our affluent midwest suburb--with its bright, upper middle class children--"right" meant something like "proven ability to provide mental and physical discipline and to produce hard-working students without shouting, paddling, or squelching curiosity." Such criteria have been at work for a long time. Except in a corner or two of the community there is little yearning for change in criteria. The new teacher usually will not be different from the old.

Enrollments decline, and it might be expected that fewer teachers would be needed to "do the job." But the regular teachers have tenure--legally or by custom. There is little turnover because teachers do not see good prospects for alternative employment in or out of education. With schools closing rather than newly building, with teachers hanging onto their jobs, with more and more issues subjected to contract negotiation, an administrator or education official desiring to bring new blood into teaching finds distressingly few positions to fill. According to the dynamics we observed in nine of eleven sites, the teacher situation is "a constant." The future in a Sun Belt boom-town such as RIVER ACRES, Texas, is less apparent. Elsewhere, the teachers a citizen sees in school today are pretty much the teachers who will be teaching there in 1985.

MANAGEMENT

According to administrators the problems of the schools are basically not curricular or pedagogical. We heard in URBANVILLE:

> The big issues here are teacher displacement (the teachers don't know whether they're going to be back next year or where), declining enrollments, and corresponding reduction of staff. Desegregation has been a problem, and probably will be even more. Increasing numbers of demands placed upon the schools, e.g., special education classes, desegregation, trying to solve discipline problems. . . .

As they saw it, if students are not learning science and math it is largely because outside pressures and inside disrespect for authority prevent the schools from operating according to design.

Until the most recent years school managers have been expected to design school operations to be more flexible, to accommodate a more heterogeneous group of students and a more varied curricular program. As public concerns about the cost of running schools and about the low performance scores of students have increased, the managers have faced (and raised) increasing demands for "accountability." This appears to be, in Pentagonese, a "no-win" situation. To concentrate on bringing up minimum scores will alienate the middle and fast learning students, and probably bring down the test averages. To concentrate on the average student, as they have in the past, will provoke both the fast and slow students, and the "study ethic" of the school will further deteriorate.

There probably is no way, in this permissive culture, with the increasing requirement for heterogeneous grouping for instruction, that the managers and teachers can get

tomorrow's students to perform up to yesterday's standards. Yet management is expected to try and they do try. They find it difficult to tell us of the impossibility of our expectations or the expectations raised by advocates of new programs. The lesson is clear. Few who do try to tell us to be realistic about what schools can do are still in top positions.

School management in this country sees public approval and financial support as imperative to the smooth running of the schools. Financial aid, program changes and additions, and reorganization all require extensive cooperation within the school and monitoring of community toleration on the outside. In order to meet these demands, interesting and worthwhile ideas in their own right such as outdoor education, photo studies or music are touted as solutions to existing problems. And promises are made that are probably impossible to fulfill. For instance,

> The superintendent of a major midwestern city, eyeing a large unexpected budget surplus, promised his board that if he could spend it on special instructional centers, he would bring the test scores back up where they had been several years before. (R. Stake's notes.)

Due to consolidation and population growth, school districts are larger than twenty years ago. They handle more pupils (although fewer than in 1971), more personnel, and more money. As expressed in the RIVER ACRES report the larger the system gets, the greater the "felt need" to manage. In some cases the school system budget is larger than any industrial budget in the community. The expectation for technical management expertise is great.

Technical Specialists. Increasingly, the educational administrators of the past have been succeeded by management specialists, a new breed of technical people. They may hold doctorates of philosophy but they are not philosophers. It may be a change for the better. The technical demands on managers are most real. There seems little disagreement among people that we should have well-trained technical people running our schools. Nothing in our experience in eleven districts suggests that philosophers could run today's schools better.

Many citizens do not see a substantial difference between running a school and running a factory. The learning factory metaphor suggests technical expertise as a solution to many demands. Most administrators seemed to accept and use this metaphor. Technology was repeatedly put forth by them as the way to get the most for the taxpayer's dollar. In education, technology can mean the use of equipment in lieu of direct teacher-student contact; it can mean the specifying of behavioral objectives; it can mean promoting a referendum for school financing; it can mean organizing the in-service training program.

We have learned that instructional technology often comes as more costly rather than less. In many schools we visited we found instructional use of television, tape recorders, math labs with electronic machines, hand-held calculators, and even television production equipment. In no place did this mean fewer teachers, less costly instruction. In ALTE and VORTEX it meant a higher adult-youngster ratio, more teacher aides or clerks, but no fewer teachers. It may have resulted in more relevant learning experiences for the students. It did not mean that traditional objectives were being pursued at a lesser cost.

When there actually is the introduction of instructional hardware, e.g., movie projectors, language labs, teaching machines and other technical equipment, specialists are needed to instruct adults and children in their use and care. And they require administrators who understand the importance of experience with technical equipment (not only to

work and preserve this equipment, but because maintenance is a part of general education today). Educational experience with technical equipment is possible and important. Technical equipment is unlikely to be the solution to poor reading scores or budget problems, regardless of what the IBM television commercials say.

But the understanding of what technical instructional equipment can and cannot do is not the sense in which today's school administrators are technicians. Their expertise is the expertise of the bureaucracy. It is used to prepare statements to get federal grants or special allowances from legislatures or city councils. It is used to organize offices to comply with federal and state requirements. One GREATER BOSTON interviewee said:

> *There is all kinds of federal money floating around, but there is a lack of basic and continuing support.*

It is the obligation of the contemporary administrator to see that none of that money floats on past. And to put it where it is needed.*

The coordination of teachers, children, clerks, and support personnel; the supervision of budgets, buses, books and buildings; and the communication with parents, community leaders, and government officials are difficult, demanding and consuming work. As one GREATER BOSTON administrator suggested:

> *A fast moving school isn't run just by humanizing the administration [a popular concept in the '60s].*

But how then should it work? Today's hue and cry is for accountability, for the evaluation of outcomes (usually defined as some measure of student competence), for the balancing of costs and benefits. This same administrator had questions about that also. Observer Mary Lee Smith reported that the writing of behavioral objectives at FALL RIVER was successful, but the implementation was not (see p 2:3). There appeared to be no penalty for setting up an impractical technical system.

We found little evidence that administrators care one way or another about science education. Science education is seldom promoted as a matter of "sound education." Management is the friend of science education when its aims and activities are important

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*One federal research project undertook to find if general financial aid to highly impoverished schools could raise the level of student achievement. In the pilot study the researchers found that school administrators in fifteen pairs of elementary schools were able to divert at least as much funding to the control schools as was provided by the federal government to the experimental schools. (In the subsequent comparisons the federal government allocation was over $500 extra per youngster in the experimental group and the local supporters only came up with $129 extra per youngster in the control group.) We concluded, with at least a glimmer of admiration, that the administrators involved were more concerned about improving the funding for all the children than in researching the effects of special funding on the achievement of those children. The research was reported in: John Coulson, et al. Third Year of Emergency School Aid Act National Evaluation, USOE Contract LEC-0-73-0831, OEC-0-73-6336, SDC-TM-52-36/014/00 (Santa Monica: Systems Development Corporation, March 1977).

to parents, those who want their youngsters to enter engineering schools, medical schools and liberal arts colleges. Or it is important when the dispensing of funds is a national priority as in the post-Sputnik days. Science education is not easily adaptable to the existing problems of community support, financial need or re-establishing a curricular emphasis on the basic skills.

Patterns of Organization. A variety of reorganizations at the district level was found in the case studies. Some were precipitated by judicial decree for the purpose of desegregation (GREATER BOSTON and PINE CITY). Others represent the influence of demographic shifts with declining enrollments (BRT, URBANVILLE, VORTEX) or increasing enrollments with an influx of white middle class northerners into the southwest (RIVER ACRES, FALL RIVER).

Declining enrollments were handled in several ways. The smallest site, in rural Illinois, which had already passed through an earlier phase of consolidation, was anticipating that dropping enrollments--a manifestation of cumulative change in land use--would compel still another consolidation. Or a new form of governing unit, the "Intermediate Educational Unit," might emerge as it has in Pennsylvania, Oregon, and New York. To date, intermediary "districts" have functioned as a support system to local schools, and their role has been to deliver services to schools with limited student enrollments in specialized areas.

Some districts may be anticipating a combination of effects such as declining enrollments and desegregation (COLUMBUS, URBANVILLE, WESTERN CITY) or consolidation by law (ALTE, GREATER BOSTON) to promote desegregation or to equalize taxing revenue. In districts with a rapidly expanding student enrollment reorganization may be found in the form of sections of a district seceding from a larger system (RIVER ACRES).

All of these reorganizations may entail the physical closing of neighborhood schools (or the emotional abandonment of the neighborhood school concept). Talk about school closings antagonizes teachers (anxious about transfers and seniority) and parents (anxious about students sent to strange and distant places and the future of residential and business areas). Of course reorganization also is seen by some as part of the community's power struggles. The struggles might be especially heated if intermediate educational districts are reassigned primary responsibility instead of support responsibility for the implementation of certain laws such as PL 94-142 or where consolidation reduces the number of administrators. Curricular improvement seems quite unlikely during contentious reorganization periods.

But there are other reorganization attempts directly intended to centralize the development, planning or revision of curriculum and/or decentralization of the administrative authority structure. We found this in RIVER ACRES, VORTEX, ALTE and URBANVILLE. We found decentralization of administrative authority in ARCHIPOLIS. Both reorganizations were occurring simultaneously in FALL RIVER. Administrative decentralization efforts in ARCHIPOLIS included the ordering and distribution of supplies and services such as textbooks and lab equipment--as well as the distribution of extra help in the form of teachers with subject matter specialization.

In this particular case the principal and teachers seemed to appreciate the effort toward decentralization regarding decisions and responsibility, but the new system also left unfulfilled certain functions performed by the old.

The organizational structures of the schools were not probed or reported much in these case studies because that was not a primary aim. It was apparent that reorganization efforts in these sites were found to expose priorities and realities that previously had gone unstated and unquestioned. Accountability and formal evaluation systems do the same. Our observations of them will be presented next.

ACCOUNTABILITY AND EVALUATION

For a long time schools have been expected to account for the taxpayer's dollar--in bookkeeping terms. More recently, the critics of the schools and the managers of the schools have called for accountability for the student learnings purchased with those dollars.

While we found only a small amount of talk about accountability at our case study sites, almost nobody questioned the assumption that an accountability system should be pressed upon the schools. No one said, "I wonder if the school people are getting so nervous about their obligations that they are actually doing a poorer job." Or, "We know that in some communities, some students are graduating from high school even though they are not capable of reading and doing arithmetic. Are the teachers responsible for this?" When school personnel in our national survey were asked why such graduations occurred, only ten per cent felt the teachers were incompetent. About thirty-five per cent thought the teachers were too lax. They checked other reasons such as "government regulations, laws, and court rulings are making schools promote unqualified students" (fifty-six per cent) and "the schools just push 'poor learners' through to get rid of them" (sixty-five per cent). The aim of accountability is to curtail such graduations and other forms of poor learning, regardless of who is responsible--but the message of accountability is a message to the teacher to do something.

What does "accountability" offer to a teacher as a concept? One thought is that it may offer more authority to teachers. An URBANVILLE Educational Association president endorsed accountability, claiming it "will become a reality only when and if more professional autonomy is achieved." Another interviewee felt it offered security (site visit report):

> *Without [accountability] we're propagating our own ignorance because we have no consistent structure. And there's great insecurity in having no positive direction.*

Schools, they say, have an obligation to show that students are becoming more competent--but how to go about achieving accountability is not something that any of our schools had demonstrated in other than the old intuitive ways.

Obviously, formal accountability depends on a means for evaluating, for discriminating among programs, teachers and students. Almost all the districts we visited had created "evaluation offices" of some kind. The ones in COLUMBUS and ARCHIPOLIS had credible national reputations. The personnel assigned to perform evaluation duties at several sites confirmed the impression that they were concentrating their monitoring on students more than on teachers and programs. Monitoring of students was found in WESTERN CITY, URBANVILLE, and RIVER ACRES in the form of "minimum competency examinations." Criterion referenced diagnostic tests were conspicuous in ARCHIPOLIS. Pretest and post-tests were in use in the math labs at VORTEX. Standardized achievement tests were administered at all of our sites.

Performance-oriented evaluation can be built into many instructional programs--performance contracting was one brief-lived effort. At the time of our observations we found organized efforts (in the form of teachers writing "behavioral objectives" and curriculum guides) at FALL RIVER, RIVER ACRES, ALTE and ARCHIPOLIS. At times various consultants and publishers had been found to provide checklists on instructional effectiveness of classroom management and record keeping for the evaluation of teachers. We found most schools using something that the teachers had created or borrowed, and modified. In ALTE they had taken a non-quantitative, yet sophisticated approach. In this comfortable suburb evaluation data included supervisory, collegial, and client feedback. (It is nicely described on page 3:77.)

We found no actual evidence of validity of these accountability procedures. But neither the teachers nor technical people at the district were seen to be raising questions about validity. They made sense to some, and few others protested. In most places the autonomy of the classroom was protection for the teacher reluctant to go along.

Criteria. Student achievement testing--albeit an important evaluation technique--is only one way in which people at our sites were attempting to meet the accountability demands. For instance, a teacher in Colorado said:

> *Schools should teach the value system that is consistent with the community.*

The language of accountability systems emphasizes independent, objective criteria, but the interviewees told us of "dependent" criteria, dependent on the reasons the community supports the schools. When telling us of how their schools are or are not living up to expectations, teachers, administrators and parents happened to cite:

--cleanliness and orderliness of the school (BRT, ALTE, RIVER ACRES)

--judicious selection of teaching ideas and materials, "We don't buy everything that comes along." (BRT, RIVER ACRES)

--offering advanced placement courses (BRT, VORTEX, ALTE, URBANVILLE)

--the advanced placement test scores (VORTEX, RIVER ACRES)

--national merit scholars (RIVER ACRES, URBANVILLE)

--a balanced budget, "We educate within our means, facilities, talent and the capacity of the populace to support." (BRT, COLUMBUS)

--the math labs (VORTEX, ARCHIPOLIS)

--homework, not too much and not too little (BRT, RIVER ACRES, ALTE)

--keeping students, especially seniors, working hard (FALL RIVER, RIVER ACRES)

--achievement in science fairs (BRT)

--achievement in music and art (ALTE, GREATER BOSTON)

--environmental education (FALL RIVER, ALTE)

--a full program of courses (ARCHIPOLIS, WESTERN CITY, ALTE)

In four of the places we heard someone say: "If the community is quiet it's a good sign that we are handling things okay."

In GREATER BOSTON we heard: "Program success is relative to what went on before and what would go on without the program." Success was often described as improvement in the atmosphere, climate or attitudes of classes and students. A better atmosphere was said to be indicated by:

--fewer discipline problems or fewer absences (GREATER BOSTON, ARCHIPOLIS, WESTERN CITY)

--fewer children leaving the public for the private schools (PINE CITY, URBANVILLE)

--fewer dropouts (GREATER BOSTON, ARCHIPOLIS)

--accessibility of school administrators (ALTE, BRT, ARCHIPOLIS) but not over supervision (URBANVILLE, FALL RIVER, RIVER ACRES)

--whether or not the kids enjoy the classes (ALTE, RIVER ACRES, GREATER BOSTON)

A rationale for the evaluation of teaching was expressed back in 1968 as researching how "teaching behavior style A is likely to enhance student competence B, in students of Type X, who find themselves in an institutional context of Type Y in a social setting of Type Z."* And many of the school people we talked to did think that way (GREATER BOSTON):

> *I don't want to make any grand claims for the system. I just know at this time, in this school, with these students it works.* (GREATER BOSTON)

But to operationalize this statement is another matter**. Ratings of schools, programs, classroom events, and teaching may correlate with achievement scores, but what to do about low ratings is unclear or may be too painful to consider. It certainly does not mean that school people and community members do not have any idea about what they want when they see it. They do.

> *This is the kind of system we want, the kind of people who should staff it, the kind of teaching, learning that should be going on and these are the ways we're going to achieve it.* (ALTE)

Informal evaluations of school programs have been going on for many years, and continue in much the same way. More and more teacher time was being spent for formal evaluation. Often it was introduced with the claim that it was needed for accountability. When discussing accountability we heard teachers talk about minimum proficiency in math and reading. The topic of science education almost never came up in the same conversation.

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*Betty Humphry, Preface to The Evaluation of Teaching: A Report of the Second Pi Lambda Theta Catena (Washington, D.C.: Pi Lambda Theta, 1967).

**Lee J. Cronbach, "Beyond the Two Disciplines of Scientific Psychology," American Psychologist 30 (1975): 118-127. Also in Evaluation Studies: Review Annual, vol. 1, ed. Gene V Glass (Beverly Hills, California: Sage Publications, 1976).

ADVOCACY, APATHY, AND CRITICISM

A number of reports on the American high school* have been issued in recent years. An excellent summary of them can be found in The Educational Forum dated March 1976. An earlier edition contained an article entitled "The High School as a Marginal Institution." Consternation has been expressed in the professional press as well as the popular press about conditions in the secondary schools, indicating at least among some people a growing fear that it is becoming of marginal value to American youth, and consequently to the larger society.

Few parents and school people we talked to in our eleven sites viewed their high school as a marginal institution. Many saw the public schools somewhat diminished in effectiveness and no longer quite as central to the education and maturation of youngsters, but clearly still the primary institutions for most young people. Criticisms were relatively few partly because children of the majority of families are successful in their young lives, and the schools apparently contribute something to that success. In the majority of the other families it is presumed that what their children need is something that the schools give the more advantaged children but somehow do not give theirs. So rather than wanting the schools to change they want to get their share of whatever it is. There was less criticism at the community level of the schools than one would expect by reading and watching the national news media. Still, there were numerous criticisms and numerous advocacies voiced by teachers and administrators as well as parents and students.

There are a number of factors outside the control of the individual school itself which may have influenced the estrangement of the parents. In PINE CITY, for example, the desegregation rulings and the subsequent flight to the white academies were seen as weakening the community support of the school and the push from home for the student:

> *Parents can influence science in school. But we have very little response from parents here. We don't even have enough parents to have a PTA here. Parents who would be interested send children to academies . . . We have three private schools in town, and a lot is taken away [from the public schools].*

Court-ordered busing, which often carries a child to a school some distance from home, also has the effect of diminishing the involvement of the parent and attenuating the sense of community, with resulting effects on the teacher in the classroom.

In our visits to eleven sites we refreshed our awareness that parents of low and middle class status will mobilize to protect their neighborhood schools--as an anti-integration measure (GREATER BOSTON), for decentralization of urban authority and increase in control for minority groups (ARCHIPOLIS), and just because it is comforting to know that the children are not far from home (GREATER BOSTON, ARCHIPOLIS and everywhere else). Parents will rise up to save athletic programs and to pass or reject bond and tax referenda (URBANVILLE). We know from the newspapers, though not from our visits, that occasionally parents strike down curricula dealing with evolution or the relativity of values.

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*Of course there is no single American high school or school system. They vary in character, in personality, and in behavior as much as the families on any block. They have common problems, common schedules, common accoutrements, but are increasingly different as one comes in close to examine them. So the criticism and the praise for the schools fit no school perfectly, and fit many very poorly.

Occasionally the family institution set out to shape the educational institution, advocating a certain curricula emphasis such as creative writing, advanced placement courses, career education, or advanced courses at an earlier grade level. One teacher in ALTE said, "The parents like to have a lot of science early. So we do a lot of science." But not at the sacrifice to high standards or eligibility to college. "They [the parents] still want to see those grades." In situations such as ALTE the parents see themselves as collaborators both in instruction and gaining community support.

But the only advocacy that spread to all situations, east and west, rich and poor, was the advocacy for a basic curriculum, the emphasis on reading and computation for all grades past kindergarten.

> *I think going back to the basics is a wonderful idea. I come from Ireland . . . and I never saw such poor spellers or such poor readers. When my son was only eight years old, he skipped two grades and graduated from high school at sixteen. I couldn't believe it because he wasn't a bag of brains.*

Some have called this kind of advocacy a form of apathy.

> *If parents have lived with the child all this time without finding out that he cannot read, there is plainly another problem here that has nothing to do with the schools.**

Criticism, apathy, and advocacy are related matters. If community and schools are pursuing a mutually-desired outcome the effort is lauded as cooperation. Intemperate and stubborn citizens who work for these common causes are widely applauded. When citizens are pushing the schools farther or faster than most people want to go then stubbornness and intemperance are seen to be offensive. In this section we have recorded some of the voices that have been raised in support of and in opposition to local science programs--and have noted as well the more common finding of parent apathy about what is taught in the schools.

Parents. Schools sometimes are seen as overly vulnerable to public criticism and parental pressure. We saw evidence of this in ALTE, FALL RIVER, and RIVER ACRES. Sometimes schools have been criticized for not being responsive enough. We saw this in GREATER BOSTON, URBANVILLE and WESTERN CITY. But in each place, of course, the schools were some of both.

There is always a question as to what the proper role for a parent is. According to the formal rhetoric parents are expected to help in setting policy, evaluating curriula, orienting children to their studies, and helping on special occasions. Certainly in most schools, the support of parents is solicited and their help is needed. Parents are often asked to sit on committees setting broad goals for the schools. But almost never are they expected or allowed to play an integral part in the management of problem resolution. The reasons are obvious: too often they do not appreciate the complexity of the situation, too often they press for personal favor, too seldom is there time to engage them, too seldom do the parents care.

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*Dorothy Wilson, Maine Times, 30 September 1977.

In some places we visited the parents were described as apathetic. Teachers and administrators expressed dismay that the parents did not involve themselves in their children's education. These school people sometimes saw the school as a different kind of social service organization, one with expertise in "parenting," instructing parents how to involve themselves in the education of their children. We saw this in GREATER BOSTON, PINE CITY, VORTEX, and WESTERN CITY. Within this definition of parent involvement, encouraging parent action did not usually include encouraging parents to be involved in decision-making that could potentially change the direction of the school.

The pressures for parent involvement usually took the form of how to help a child with homework and encouragement for regular attendance. Parents were encouraged to attend parent-teacher conferences. A parent explained the high-need/low-success of such efforts in ARCHIPOLIS this way:

> *Many parents did not help the teacher or talk to their children about schoolwork because they were ashamed to reveal how little education they had.*

Obviously, there would be other reasons for the appearance of parent apathy, and indeed what appeared to the teacher as apathy may be something quite different.

Our field observer in ARCHIPOLIS examined the condition carefully and in one instance said:

> The greatest concern expressed by parents centered on their efforts to correct problems perceived or observed in schools. The "Catch 22" quality surrounding every attempt to get things changed made them feel powerless against the system and ineffective as one of the partners in the schools' efforts.

Teachers in many of the CSSE sites spoke wistfully or even bitterly of lack of support from the home. They saw it creating a sense of isolation which had negative effects on educational achievement. In the PINE CITY site visit, a general science teacher, talking about a particular group of students, said:

> *These children do not have the push from home that my better students have had. You can tell--if the parents are concerned, the kids are going to be working.*

The parental pressure that is observed (we heard in the same discussion) is not directed to science:

> *I get the impression that most of the parents are concerned with the basics. . . . If a child gets a "needs improvement in reading" compared to a "needs improvement in science," they're much more concerned.*

However, some reported parent apathy even as to reading. At BRT we heard:

> *One of the biggest problems with reading is parents don't have time to listen to their children read.*

They complained too that parents don't read to their children. It was attributed at least partly to the impact of TV. From a PINE CITY math teacher we heard:

> *You're going to find that a vast majority of our parents cannot even tell you who their students' teachers are or what subjects they're taking. I imagine that 75% of our report cards never go*

> *home. They're signed by the students themselves. . . . The parents are caught up in a financial situation and social situation, and it's a dog-eat-dog world out there and they're just not spending as much time with their children as they should.*

Some parents agreed that parents as a group were negligent as to their child's education:

> *The little ones need to be helped with their flash cards. A lot of parents won't take the time.*
>
> *We blame the teacher that our child isn't getting this, but we won't say, "how much is 3 times 1?".*
>
> *I don't feel the schools can do everything--it's just too big . . . there are so many things the schools can't teach. I feel like the big breakdown is parents.*

We heard dissenting opinions too. The math chairman at the same site said:

> *In many of the homes, there's a strong emphasis on learning.*

It's important to note, however, that this same person earlier had been talking about a loss of academic perspectives, non-motivated students, and students in algebra who shouldn't be there. He also took a negative stance on social promotion. In fact, this comment on the family emphasis on learning was the one bright spot in his otherwise dismal scene--and in fact is a bit difficult to reconcile with those facts. The social studies teacher at BRT also spoke about community pride in the school (see BRT, p 4:29 and p 4:41).

Some teachers felt there was not only a clear abdication of parental responsibilities but also an attempt to shift these responsibilities to the school. During the URBANVILLE site visit we were told:

> *In the years I've been teaching, it seems to me that more and more through the years the schools are expected to do a lot of things that parents should be doing. The parents will come to school and say, "Well, I can't make him do this. Good luck." Like do his homework or read a book. . . . I think it's a mistake to expect that we can solve all the problems a child has while even solving his academic ones. . . . Parents have to assume more responsibility for the education of their child. . . . There has to be more involvement.*

Some at BRT took a philosophical view of all of this:

> *There's nothing you can really do about the home, so you have to make the atmosphere in the school. . . . You have to make up any lack [that occurs in the home]. (p 4:43)*

Estrangement and Indignation. Why have the parents not been more vocal than they have in influencing the local curriculum? We did not directly pursue this question, but encountered various suggestions. In two of our sites we scheduled open hearings at which people could come and express themselves. No parents or out-of-school people came. We arranged to talk to other parent groups and asked why no one came. They guessed that no one expected that it would do any good.

The ARCHIPOLIS teachers were having trouble getting parent chaperones to accompany field trips. One parent speculated that parents there were reluctant to reveal how little they knew about things. Teachers had trouble getting those parents to help with homework too. Several teachers commented that this situation had become worse with lessons that are different from those the parents had in school.

Changes in the curriculum as well as changes in the disciplines themselves seem to have made some parents feel incompetent to help the child at home:

> *With this new math, I don't help my children out from the seventh grade on up and I think a lot of parents feel that way. They just don't understand; it's not what they learned. The wording of it, more than the math, is different.*

This is probably not a trivial effect. In the past, when children had problems with specific subject areas in school, the parent could often explain it in a way that made it clear. By not having this backup system (the parents) available, the schools have lost a valuable source of support in this one subject area, at least, and children who might have gotten certain concepts with a bit of additional help from their parents do not. Furthermore, this has no doubt fed into the disinterest and alienation that many parents seem to feel vis-a-vis the school system.* At one of the site visit meetings in RIVER ACRES, a parent speaking about math said, "I'll leave it to the teacher," and was greeted with a round of sympathetic laughter.

A factor that <u>is</u> controlled to some extent by the individual school is <u>homework</u>. If it is not given, one of the major means the parent has of monitoring what goes on in the school is removed. One RIVER ACRES teacher recognized the parents' insistence on monitoring (p 1:51):

> *The eighth-grade text does not meet the needs of anybody. It is about college level. The society in which we teach dictates the use of a textbook, however, so, even thought I don't use it in class, I send it home every now and then to keep my parents at bay.*

However, the following quote also from RIVER ACRES makes it clear that the relationship between assigning homework and maintaining some degree of parental support is not necessarily a direct or simple one (p 1:14):

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*The Carnegie Council on Children Report contended that schools and other social institutions function in such a way as to make it very difficult for families to <u>cope</u> with them let alone <u>support</u> them. See Kenneth Kenniston, <u>All Our Children: The American Family Under Pressure</u>, The Carnegie Council on Children (New York: Harcourt, Brace and Jovanovich, 1977).

> *Homework that is busy work is trash. Teachers wonder why I don't ask my children to finish it. I don't think it is worth doing, that is why. . . . I don't want to minimize the problem. I just hate not supporting homework. . . . but when it comes down to a silly geography cut-and-paste-the-rivers project and attending the Houston symphony my daughter will go to school humming Chopin the next morning.**

This statement is an interesting one. It shows not just lack of support, but a clear overriding of the prerogative of the school to assign homework. The parent apparently felt competent to make decisions about what scholastic activities are, and are not, instructionally worthwhile for her child. Furthermore, she may be providing her daughter with a model for interacting with the school. It supports the view that the growing distance from parents that many teachers feel is a complex phenomenon, and one that will not easily be resolved.

The BRT superintendent touched several possible explanations when he discussed homework:

> *I looked at the amount of homework that students take home today versus when I was in high school--and they don't have homework like we did. The teachers for one thing, don't believe in it as much, at these smallish schools. . . . Parents really object to homework and the teachers say that a lot of the students won't do anymore. I feel this is a little alarming, in a way.*

To what extent the proximity of the home and school as well as changes in curricula, the disciplines themselves and the assigning of homework, are causes of the schism which seems to exist between many parents and the teacher in the classroom, and to what extent they are simply indications of a deeper disenchantment with both education generally and the work ethic, we cannot say. There is certainly evidence in the case studies and from the site visits that both are involved.

New names for subject matter or courses and the "alphabet soup" of PSSC, Title IX, and 94-142 further weaken the self-confidence of some parents. Terry Denny reported that one Texas parent who avowed she could not help her child with language arts was surprised to find that it was just another name for spelling, grammar, and reading (p 1:23). At another level, an Illinois science teacher proposed a science course for adults to get them to the level of their children:

> *I'd like to be able to teach adult science education. So much has changed since the parents of today's kids got out of school that their kids probably know more about science than they do.*

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*The reader is urged to consider the full quote in the RIVER ACRES case study, (p 1:14).

Even in a "progressive" district such as ALTE the parents resent some efforts to change the schools. A principal said:

> *Parents are committed to graded education. You can change anything else--space, curriculum--but not ungraded or a mix of grades. We tried that ten years ago. . . . We had a big room of second and third graders and for years afterward everything was blamed on the "big room."*

The reader of all eleven CSSE case studies will not draw the conclusion that 1976-77 was the year of parent indignation. Rather, each site had its stories of years past, when parents rose up to oppose the "big room" or the closing of a school. Four years ago white middle-class parents removed their children from the newly integrated public schools in PINE CITY and only now are starting to return. In FALL RIVER parents invaded classrooms to see what was going on when a new instructional method called PLAN was introduced--it has since been reduced in scope and parents have been permitted to opt their children out.

Most of the parent criticism is general. A young parent said:

> *I don't think kids are always taught how to learn. . . . When I went to (the) state university, I found out I didn't know how to study. I had absolutely no concept of how to study. I had never done it, I had never needed to do it, I had never been pressured into doing it.**

Valuing Science Education. From our interviews we found the parents interested in talking about the curriculum in-the-large and seldom with much to say about specific courses. Most thought that science education was important, especially for the college-bound. For the rest of the children it was important too but not much time should be spent on science if reading or computation skills needed working on.

We were perplexed by this. We wondered if school leaders really did not see science and science education as being important. We asked a random sample of school superintendents across the country the following question:

> For many students the science goal "understanding the world in which we live" seems remote and impractical. Students now enroll in few science courses unless required to. Less science is being taught now than in earlier years. Do you think this national trend will have serious negative effect on . . .

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*It was clear how teachers respond to such criticism, whether or not it applies to them. In part, it drives them to stick ridigly to textbooks and syllabi, in part it drives them to freeze the curriculum in ways reminiscent of Benjamin's Sabre-Toothed Curriculum, a satire depicting cavemen who taught techniques for thwarting sabre-toothed tigers long after they had become extinct.

	said "yes"	said "no"	said "don't know"
... the growth of technology in our society	74%	20%	6%
... the economy of our country in years ahead	71%	19%	10%
... military preparedness in this country	57%	33%	10%
... the "quality of life" in this country	79%	15%	6%

(Of 150 superintendents sampled only 74 responded; one of these omitted this entire item and another omitted the last two parts. The percents above are based on those superintendents who responded to that part of the item. Standard errors are in Chapter 18. Results have been weighted according to RTI sampling plan.)

When we asked, "Should the schools try to do something to reverse the trend away from science?"

59 superintendents checked "yes"
9 superintendents checked "no"
and 6 superintendents checked "don't know."

Noting that only half of the superintendents responded and reminding ourselves that there are many more small districts than large, we concluded that the superintendents of most of the school districts do feel that the trend away from science education will have a serious negative effect on the well-being of our country, and that the schools should try to reverse the trend.

With such a strong inclination to see the deterioration of science education as a serious national problem, one would wonder why they do not speak out in their districts more for science education. In not one of our CSSE districts was the superintendent known to be an advocate of science education more than something else. The problem is that superintendnets as well as the rest of the school people have largely accepted the position that students cannot learn science until they have shown proficiencies in reading and math.

This struck us as equivalent to putting a low priority on science. It seemed obvious to us that most children would never master reading and computation to the satisfaction of a science teacher who had such prerequisites. It seemed that the only way to teach most children science is to begin teaching them before kindergarten and during every grade, along with reading and computation, relying on those skills possible, but not waiting on them.

Some teachers and administrators do see it that way. The national survey data presented in Chapter 14 show a clear division between teachers who believe that the concepts and complexities of science should be taught from the outset versus those who would teach skills first then the complex subject matter.

Another issue that had strong implications for the science curriculum was the interest people had in vocational education versus liberal arts education. Many parents wished that the schools would be more concerned about getting students ready for vocational responsibilities, and many school people agreed. Naturally, most of them did not

see an obvious role for science courses when the task was getting non-college-bound Johnny ready for the job market. Yet 2/3 of our parents and teachers felt that some proficiency in science should be a requirement for high school graduation. Another perplexing situation. Of course, it is easy to say that children ought to be required to learn everything that was, is now, or ever has been in the school curriculum.

Results from survey questions on the importance of a vocational orientation in American schools are presented in Chapters 12 and 18. By and large, parents saw the responsibility for vocational preparation as more important than school people did. But few appeared ready to sacrifice any of the scholastic program in order to get youngsters more ready for jobs. They seemed not to see it as a trade-off. The more important different tracks and different programs they expected to be continued. They seemed to feel that the ideal program would graduate every boy and girl fully prepared in the learning skills, knowledgable in the traditional subject matters, eligible for college, and ready to take a full-time job.

From other questioning it was apparent that administrators and parents were concerned about youth unemployment and the hollowness of the admonition that "if you don't do your schoolwork you are not going to be able to find a good job." But there did not appear to be a strong feeling that the schools can do much about making the courses more vocational. Here again the belief was that work on the basic skills is most likely to be of value to the employment-seeking youth.

The schools, as agents for socializing children in the values, myths and ethics of the dominant culture of their own communities, are also expected to produce change in preparation for the unknown future. Each community struggles with it. Parents and teachers alike fear they might be subverted by reform, be it integration (PINE CITY, GREATER BOSTON), open space instructional settings (VORTEX, RIVER ACRES), ungradedness (ALTE), or innovative curriculum (FALL RIVER, WESTERN CITY).

Preparation for the future is more often thought of as the working career, not of the future social order (PINE CITY, FALL RIVER). Perhaps there are enough other institutions worrying about the future social order. That future our parents seemed not to concern themselves with. The expectation that the schools prepare children for their future work does not always include the need for having the latest teaching techniques or special programs, certainly not giving up discipline, hard work, stress on the basic skills, or achievement in the traditional form of test scores. As one well-educated black parent said:

> *One cannot honestly and realistically conclude that science teaching is occurring at (this school) if one expects most students to be prepared to deal with science at a level of expectation that is functional now and in the future. However, if one feels that the personal involvement and choices of students is more critical to the life chances of these children, (this) way might be the way to go. I would not want the experience for my children for I cannot afford the risk.*

To get an overall, most general feeling as to how good (or how bad) people in and around the schools perceived their curricular programs to be, we asked the following question in our survey:

> Even though it cannot really be summed up in a word, what do you feel is the overall quality of the high school science program?
>
> ___ excellent ___very good ___satisfactory ___poor ___other

We asked the same question regarding the high school math program and the high school social studies program in the district. The median responses were as follows:

	Science	Math	Soc St
Parents	Satisfactory	Satisfactory	Satisfactory
Seniors	Satisfactory	Very Good	Very Good
Teachers	Very Good	Very Good	Very Good*
Coordinators	Very Good	Very Good	Very Good
Administrators	Very Good	Very Good	Satisfactory

*but close to satisfactory

Very few of the respondents used any category other than satisfactory or very good to describe the curricular programs. Even though most people were able to tell interviewers or to describe on the survey forms some shortcomings of the courses, their overall summary of the high school programs was that it was at least satisfactory.

SCHOOLS AND CHANGE

Paradoxically, schools are the agents of change and the deterrents to change. The communities we visited are troubled in many ways, would like relief from their troubles, and occasionally see the schools as a potential contributor to the relief. Different people see different troubles, so there is no universal mandate. What one person would like to have changed would upset another. The remedy that one person has in mind would further upset another. Few people in the schools we visited are interested in creating a new society. Most spoke in support of returning to a better day, how it was, or perhaps how it seemed to be.

Social Change. The society changes the schools and the schools are called upon to change the society. Since World War II two long and trying episodes, the Cold War and the Civil Rights Movement, have greatly increased the federal and direct societal involvement in schooling.* The Cold War set the stage for federal involvement through its demand for technical manpower, a demand that seemed to call for better science and mathematics curricula. The leadership of our society answered the civil rights demands by committing the schools to racial integration and the reduction of poverty through basic and vocational instruction. Schools have recently been used as a major instrument to respond to widely recognized national needs.

The people, including the professional educators, by and large supported Cold War efforts, and were enthusiastic about adding additional courses and ways of teaching to further that cause, and perhaps even to improve education for other purposes too. The people, including the professional educators, were considerably less enthusiastic about the integration of the schools and the responsibility for teaching children unready or reluctant to learn. They turned against the curriculum reform movement when they found it at odds with their purposes and difficult to manage. They came to accept programs for poverty children because the programs brought in federal money, but they were dismayed by the problems accompanying that instruction. We found the people at our sites, in and out of school, not much interested in desegregation and war on poverty, but greatly interested in an emphasis on the basic learnings and concerned about how the schools will pay their bills.

The idea of making the schools the instrument for adapting to social change may overestimate the schools' ability to remedy social ills. There were some bright spots. The social barriers (not the economic barriers) for blacks appeared to be succumbing to school efforts in PINE CITY, Alabama. Control of the school system by blacks was increasing in ARCHIPOLIS and the GREATER BOSTON high school we observed, but even that

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*Joel Spring, The Sorting Machine: National Educational Policy Since 1945 (New York: David McKay Company, 1976).

slow change was not matched for Mexican-Americans in WESTERN CITY and RIVER ACRES. The disparity in economic opportunity and social privilege is not noticeably improved even though all of our schools' clusters had some involvement in federal war-on-poverty aid-to-education except ALTE and the Hardy cluster in URBANVILLE. The traditional view of our schools has been that they were the key agent in transferring the country from a manual-agrarian society to an industrial-commercial society, which we presume we wanted to be--therefore, the schools should be able to transfer us into anything else we want to be. It does not seem to work out that way.

This is not to suggest that the schools should not be participating or even leading in the efforts of a nation to improve itself. We should change our schools in terms of what is morally right as well as what is instrumental to change. The schools should be agents for improving the margins as well as the center, and the success of the system will be put to the test with its minorities: the blacks, chicanos, emancipationist women, handicapped and others. The schools should reflect our ideals. But our visits to eleven sites helped persuade us that too much of the improvement of our society was being assigned to the schools--and the school people were resistant to the assignment.

We were satisfied with the efforts of these schools to act as a forum for ideas of social change. The discussion of social reform was not as prevalent there as on television and was usually couched in traditionalist-value statements, but the debate was curtailed mostly by a reluctance to "get off the subject" of the regular lesson* rather than a reluctance to consider the social problems that needed correction. The debates that do occur may be a greater contribution to social change than either its role in desegregation and in economic reform for the issues of desegregation, poverty, sexism, special education for the handicapped, sex education were raised by the students and the teachers in the schools we visited.

Education is an institution. In this country it is a traditionalist institution. Public schools are organizations. We found them to be committed both to the service of society and the protection of themselves as organizations. They are social systems within the social system, enrolling 89% of all children between the ages of five and seventeen. This school age population is 25% of the total population.** In these schools the children learn who they are and who they are not; they learn ways of becoming somebody else and they learn the obstacles to becoming somebody else.

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*Many would argue that at least in the social studies the social change topics should be the lesson. We found essentially no advocacy among teachers, administrators, students, or parents to decrease the concentration on history and abstract political systems in order to spend more time on contemporary social issues in the social studies.

**10.5% of all children are enrolled in private schools, making 99.8% of all children between the ages of 5 and 17 enrolled in school. National Center for Educational Statistics. Statistics of Trends in Education, 1965-66 to 1985-86.

The schools continue to build their own social and instructional technology. They work hard at defining teacher, administrator, pupil, specialist, classroom, grade, and course. At the district level they are so formal, so well organized and defined on paper that they are easily identifiable and therefore vulnerable to attempts at manipulation. The purpose is to make them more manageable to administrators outside the school building, but they thus become vulnerable to management (manipulation) from any outside political forces. It is not surprising that, as observer Mary Lee Smith noted in FALL RIVER, Colorado (p 2:1):

> People outside the schools have relatively simple ideas about how schools work: to change education in a desired direction, one must merely manipulate one or two variables.

But any changes that must be made will be influenced by other changes taking place.

Our study was not a longitudinal study, so we had to rely for perceptions of change on what we knew to be true earlier at other sites and what our respondents told us. But we have little doubt about changes that are occurring in the following:

--in unionization of teachers, especially in VORTEX Pennsylvania, URBANVILLE Washington, COLUMBUS Ohio, and ARCHIPOLIS on the eastern seaboard

--in open or informal instructional arrangements, especially in our midwest suburb ALTE, RIVER ACRES Texas, VORTEX Pennsylvania and FALL RIVER Colorado

--in the size of school districts, especially at BRT Illinois, URBANVILLE Washington, RIVER ACRES Texas, and FALL RIVER Colorado

--in the source of funding, increasingly from federal and state sources, with accompanying restrictions for its use, at all our sites

--in the amount of desegregation in PINE CITY Alabama and in the GREATER BOSTON site

--in the use of automated and electronic equipment in VORTEX Pennsylvania, and at ALTE, our midwest suburb

--and in the use of special personnel, such as aides, in our GREATER BOSTON site, in VORTEX Pennsylvania, at ALTE, our midwest suburb, and at WESTERN CITY California.

These changes by and large have been structural changes within the educational system itself. They are changes that stand on their own and cannot be totally judged by outcomes in instruction. Unionization will affect teachers' income and ideas about work load--we do not have measures of educational quality or student achievement that are sensitive to their more indirect effects. It would be simpler if we could use such outcome measures, as critics and allies alike sometimes suggest we should, but the effects

on the schools and effects of the schools are parts of many social purposes, not just of getting children instructed. Science education and desegregation are now both purposes of the schools, sometimes they will be unrelated and sometimes not. In one of our sites we heard:

> *We would never have had a specialty program in chem technology if it weren't for desegregation. . . . We're enlarging the chemistry facilities at the magnet school and we're developing additional curriculum.*

It is difficult to consider the relationships of school and society by any small number inventories, tests, and social indicators.

In our CSSE schools we found change and we found stability. Generally the schooling process remained the same:

--the teachers were in control of classrooms

--the teachers identified the textbooks as the authority on knowledge

--emphasis was given to working hard, keeping busy, being polite, competing, aspiring to improve, working independently, and preparing for things to come

--the lessons were to follow an order, curricular things had their place

--a single dimension of work quality, graded usually from A to F was sufficient to evaluate students of diverse backgrounds, interests and modes of expression.

But even with this stability, in every site teachers, administrators and parents were saying that the children have changed. In many respects they do not like the change, even discounting the fact that no older generation probably has ever approved of change initiated by the younger. Each generation clearly sees that the younger folks do not work as hard as they did. And now children are seen to lack motivation, concern about the future, and respect for authority. "They think too much about cars. They go off around the world. They don't settle down to a real job." Teachers are as dismayed by this view as other adults are.

Most teachers feel that there is not much the schools can do to bring about social improvement. The case studies of FALL RIVER and GREATER BOSTON spoke of these limits, though without a strong sense of discouragement. At all the sites we found people feeling that the changes were happening too fast--that the schools could scarcely keep up, let alone lead the change toward the better or head off the change toward the worse.

Since schools participate in social change as a result of forces outside the community more than of those within, it is more a matter of when, where and how much change rather than whether or not at all. The PINE CITY Alabama school was ahead of the white community in the area of desegregation and was careful to hold the line elsewhere, both academically and socially. After thinking about these forces, ALTE observer Lou Smith wrote (p 3:26):

> The local district arrangements in curriculum and teaching--science education if you like, are not happenstance, not chance, nor accidents, but the resolutions of individual choices, contending points of view, and differential power. NSF (and the other outside groups) become a fourth category of contestants with its own resources and rewards, its own point of view with all the internal consistencies and inconsistencies, its own skill in persuasion and influence.

As more agencies express concern and attempt to help in the remedy, the feeling within the school is that control and hope for improvement are being lost.

Academically the desired change today is in the production of better achievement test scores and directing children's learning toward things most adults are familiar with. Change is desired for keeping up the advance of science, whether on environmental issues (so noticed in FALL RIVER and ALTE) or with regard to the traditional route to college (so much a concern in URBANVILLE, WESTERN CITY, VORTEX, and RIVER ACRES). Socially the desired change is in responsibility to majority community values by local communities and to pluralist groups by national groups. Most people want "all of the above." The argument starts when we talk about how to get them all. One science teacher in URBANVILLE said:

> *It's okay for them (minority students) to be here but they better understand that they have to live up to our standards.*

A less frequently heard voice replied:

> *It is time we recognized that a pluralistic community means that different standards are okay for different people.*

With such pervasive and subtle disagreements as to the desirability of social change it is not surprising that the schools have a confused and problematic role in our contemporary society. And of course, the confusion spills over into the traditional role of the schools to provide instruction and educational opportunity to the youth of the country.

Curriculum Change. In an article which asked: "Whatever Happened to Curriculum Reform?" Donald Schön wrote of his concerns about past efforts to fashion nationwide curriculum changes.* He specifically noted the roles of NSF and the science "establishment" in the course content improvement effort of the last two decades. This M.I.T. philosopher of science speculated:

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*Donald A. Schön. "Whatever Happened to Curriculum Reform?" National Elementary Principal 56 (September/October 1976): 31.

> *What would it be like to make implementation or adaptation central to the enterprise? How might a central institution take on the role of providing the framework, tools, means of assessment, and resources to local schools so that they can become more competent at adaptation or implementation and indeed at design?*

As indicated several pages earlier, the purposes of local practitioners are not always in tune with curriculum specialists or leaders in science. In fact, much of the literature about curriculum reform alludes to the unwillingness of teachers and administrators to pursue the aims of those on campuses and in agencies. The presentation of the previous chapter, that the problem is less one of willingness than of contradictory purposes, has implication for future plans at reform.

The dilemma presented to federal agencies was nicely put by Ernest House:*

> *. . . Most innovations as now advanced are shaped by the producing system rather than by the people who must use them. One can create new medicines and try them out without any understanding of the human body, but that is not always an effective or wise thing to do. The receiving organism must be understood and respected.*

These CSSE case studies, as well as other parts of our report, lend much credence to the observations above. Organizational barriers to educational reform are particularly formidable in the United States. The late economist E. F. Schumacher underscored another dimension to the quandary. Cautioning that new legislation or policies are only preparatory measures, he stated: "New methods of organization are required, because the policy is in the implementation."** (his italics) A report of the Education Commission of the States spoke of the resulting condition.

> *Many innovations in instruction which have been introduced in order to satisfy the demands of parents and students have been found wanting. One of the reasons why so many innovations have failed may be the fact that they are introduced into a matrix of the traditional form of governance in education.****

There are those who feel that educational management may be becoming politically sophisticated--with the expectation that fewer "non-implementable" programs would be legislated in the future.

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*Ernest R. House, "Transferability and Equity in Innovation Policy," mimeographed (Urbana: CIRCE, University of Illinois, 1976).

**E. F. Schumacher, Small is Beautiful: A Study of Economics as if People Mattered (London: Blond & Briggs, 1973), p. 188.

***Intergovernmental Relations and the Governance of Education: A Report to the President's Commission on School Finance, Russel B. Vlaanderen and Erick L. Lindquist, Education Commission of the States, Denver, Colorado, 1972, pp. 4-5.

> *It is clear that localism continues to hold significant symbolic value in American federalism, but has more persistent operational consequences in education than in any other sector of governmental activity. . . . When federal funding at long last became available education was catapulted into intergovernmental administrative arrangements that were already familiar in other sectors, improvisational and unwelcome as they may have seemed to educators. Now that the initial shocks have subsided, the latter have begun to develop political skills and wrestle with concerns comparable to those of other participating sectors, trying to sort out the dilemmas of centralized policy making and decentralized delivery of services, modes of accountability, and meaningful citizen participation.**

Several "targets of opportunity" for productive--and needed--research are sketched in the Executive Summary of this CSSE Report. Many other CSSE observations have implications for an NSF research program. As one illustration, growing concern among many citizens relative to the desirability of small-scale, community based programs and services is apparent in the same historical moment when pent-up demands for equity are adding new layers of managerial functions to the burdens assumed by public schools. What are the implications for research, policy, and practice?

Contrasting viewpoints of the dynamics surrounding curriculum change appear below. The portrayal they offer holds unique salience for the National Science Foundation. Richard Carlson said:

> *Modern math does not call upon the school system to provide a completely new service or teach a new subject. Modern math is a new way of ordering and teaching a firmly established part of the school program. To adopt modern math a school system generally accepts new textbooks and other instructional material and provides some retraining of teachers.***

But Seymour Sarason said:

> *Many teachers are in trouble with the new math. Second, the sources of trouble are many but among the most important are the consequences of how it was introduced to teachers, and the difficulty teachers have in voicing questions, problems, and doubts which they fear will*

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*Edith Mosher, "Education and American Federalism--Intergovernmental and National Policy Influences," The Politics of Education, 76th Yearbook of the National Society for the Study of Education, Part II, ed., Jay Scribner (Chicago: University of Chicago Press, 1977), p. 118.

**Richard Carlson, Adoption of Educational Innovations, The Center for the Advanced Study of Educational Administration (CASEA) (Eugene: University of Oregon, 1965), pp. 14-15.

> *be construed as a lack of intelligence and competence, and the tendency on the part of administrators and supervisors to relate to teachers in a way conducive to one-way-conversation.**

Certainly most of our observations have been in line with Sarason's appraisal. A more recent publication of his treated "the myth of unlimited resources" allegedly guiding reform efforts in the 1960s, and called for more use of "networks,"** His exploration of "mesh (saturated) networks for diffusion of innovations or cultural norms" deserves further study. It appears closely related to the earlier work of Swedish geographer Torsten Hagerstrand and his American interpreters.***

Universities and curriculum reform funding sources confront the possibility of serious "mismatches" between current arrangements for institutional services and emerging social problems, Schön asserted.**** Recent struggles with educational dissidents and social critics on the one side, and fundamentalist groups and their Congressional allies on the other, have made NSF officers aware of the consequences of controversial "mismatches." Several years ago, Dean Robert T. Schafer of Teachers College, Columbia University, cautioned that universities face many dangers in trying to provide services (including curriculum development to meet the broad-based needs of public school children).*****

> *Since basic knowledge in many areas is lacking, much so-called educational service consists in reality of providing pseudo-authoritative answers to questions not presently capable of resolution. . . . This kind of so-called professional service can only dissipate the energies of a university faculty.*

Even the appraisal of educational needs may be an inappropriate task for university research and development teams. Lee Cronbach cautioned that educational evaluation "is first and foremost a political activity, a function performed within a social system."****** We submit that the CSSE studies clearly document the need to examine the "system requirements" of schools as political-social institutions.

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*Seymour Sarason, The School Culture and Processes of Change, The Henry H. Brechbill Lectures, University of Maryland, 10 January 1966, p. 16.

**S. Sarason, C. Carroll, K. Maton, S. Cohen, E. Lorentz, Human Services and Resource Networks, (San Francisco: Josey-Bass Publishers, 1977).

***Two of Hagerstrand's publications stand out: The Propagation of Innovation Waves (Lund, Sweden: Royal University of Lund, 1953); and Innovation Diffusion as a Spatial Process (Chicago: University of Chicago Press, 1967). Ernest R. House, The Politics of Educational Innovation (Berkeley, Cal.: McCutchan Publishing Corporation, 1974), is one who has explored Hagerstrand's theories.

****Donald A. Schön, "The Technology of Public Learning," 1974, (mimeo, p. 3).

*****Robert J. Schafer, The School as a Center of Inquiry (New York: Harper and Row, 1967), pp. 75-76.

******Lee J. Cronbach, "Remarks to the New Society," Evaluation Research Society 1 (April 1977): 1-2.